Good Participation in Web-based Public Participation Geographic Information System (WPPGIS)

by

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Abstract

Development of Public Participation Geographic Information System (PPGIS) was an attempt to bring technology to communities for their decision-making. To overcome the limitations of the traditional public participation and with the huge progress in the web-based technologies, community planners added Internet to the PPGIS. Web-based Public Participation Geographic Information System (WPPGIS) is an integration of offline and online participation that is benefitted from both face-to-face interactions of the traditional participatory meetings and the open, convenient, deliberative, fast, fair, and interactive online participation.

It is critical for every participatory decision-making project to ensure whether the pre-set objectives of the participation have been met, whether the process has been satisfactory and meeting expectations of the planners and participants, and whether the applied methods and tools resulted an effective/successful public participation. As the result, evaluation of the effectiveness and success of the participation is mandatory to a complete participatory process. However, due to the lack of available standards and manuals on how to implement a successful participation, this thesis attempts to investigate the components of a good participation in WPPGIS.

Through extensive literature review, this study proposes a comprehensive list of potential criteria for evaluation of offline and online participation in WPPGIS. It is hoped that the list can be modified to the needs of each WPPGIS project. Furthermore, the main focus of the research is providing a practical guide for practitioners to encourage further discussions on how to consider effectiveness and success of the participation from early designing and initiating of the project. While the relevancy and validity of the many results of the reviewed researches can not be

tested, the research followed a constructivist paradigm that considers truth as a relative matter. In this way, the conclusion of the study relies on the subjective interpretation of the researcher on deciding whether a certain criterion is valid.

Due to the uncertainty on the definition of a good participation, the current research provides an opportunity for participation initiators and participants to re-frame their definition based on the listed criteria and their project-specific requirements. Furthermore, the list is a suggestion rather than a guideline and not all the components needs to be included to make a participatory decision-making a good participation. Web-based technology, digital skills, and socio-demographic characteristics of many communities has changed tremendously. While it might make several evaluation criteria non-appropriate, it has been left to the decision of the initiators of a project to adopt them based on the specific requirements of their project. In conclusion good participation should be defined for each participatory project, individually. The list would provide enough material for participatory projects to discuss on the necessities and requirements of their project to make participation good and effective.

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Introduction

People have the right to have a say in decisions that might affect their lives (Sewell & Coppock, 1977, as cited in Schlossberg & Shuford, 2005, p. 18). However, it is a given right, which is dependent on the authorities and governors to decide whether they want to supplement such opportunities for public engagement (Thomas, 1995). There are other factors that limit participation, and unless decision-makers recognize those factors and intend to resolve them, the public can not meaningfully participate in their community decision-making cases. Some of the limitations such as non-liberal political systems are inherent into the power system of the community and cannot be tackled. However, in a liberal community, governors are responsible for engaging the public and encouraging consensus-building. Even when the primary goal of the decision-makers is public engagement, reaching to meaningful participation that provides an opportunity for the public to influence decisions is challenging. Limitations might be based on the selected participation methods, tools, socio-demographic characteristics of the public, facilitators' experience, power relation in the community, cultural taboos and constraints to participation, cost-benefit of participation, sponsoring agencies' interests, and types and extent of the interactions within the community that can determine who and how should be engaged (Schlossberg & Shuford, 2005). Furthermore, people have a different motivation to participate in decision-making (O'Connor, Schwartz, Schaad, & Boyd, 2000).

Objectives, stakeholders, and expected results determine the proper participation method (Schlossberg & Shuford, 2005). However, participants and authorities might have other method preferences (Chase, Decker, & Lauber, 2004). Authorities should provide several options and alternatives for participation to engage significant number of the community members in decision-making (Schlossberg & Shuford, 2005). While increasing the number of the participants is an essential factor for deliberative decision-making, it is important to carefully maintain the quality of the interactions and communications among participants and between authorities and community members (Richards, Blackstock, & Carter, 2004). Also, extending the scale of the participation has two sides. In a sense providing an opportunity for engagement to more people sounds a positive result of larger-scale participation. However, increasing the scale might also

decrease representativeness and sense of belonging to a community (Schlossberg & Mattia, 2003). As a result, each participatory project needs to clarify its objectives and decide about participation methods and evaluation criteria based on those set objectives and characteristics of the related stakeholders. One criterion that might be a relevant factor in the effectiveness of one practice might trigger different consequences in another participatory decision-making.

However, similar component of all of the participatory projects is the flow of information and how the information triggers further participation. In that sense, relations are defined based on the people's roles in production, dissemination, or consumption of the information. Good participation revolves around the fact that how information has been transferred and what has been the impacts. Authorities and participation planners can extend this idea and determine evaluation criteria of good public participation. For instance, knowing that roles in the decision-making process can change and is not fixed, helps practitioners to consider participants as knowledge producers, consumers, interpreters, and disseminators, that can participate actively to make informed decisions, communicate with authorities and other stakeholders regarding their interests, concerns, and consensus-building, commit themselves to the acquired results of the participation process, strengthen their bonds with their community and compromise their interests, and develop and promote knowledge on their community and its related issues.

PPGIS was first introduced to engage public in using technology in their decision-making. The GIS technology was supposed to promote further participation, but the result could be quite the opposite, and the technology became a source of marginalization and isolation. As a result, PPGIS implementers had to deal with further constraints for public participation than the traditional methods. Later moving PPGIS to the WWW, made these relations even more challenging, because not only people had to have technical knowledge of GIS, mapping, and Internet, but also, they had to have access to technology and the Internet. It seems that the integration of offline and online environments in WPPGIS is an attempt to overcome the limitations of each of those techniques with the strengths of the other methods. WPPGIS is trying to use online and offline participation as complementary.

The field of public participation is more of case-specific and practice-based initiatives. There are not many precise definitions, standards, manuals or guidelines that could be prescribed and implemented for all of the participatory decision-making cases. As a result, when there is no

standard, then the evaluation of the quality of a participatory process is a big challenge. The current thesis is an attempt to review the available literature on the evaluation of participation that can be modified for application by many WPPGIS projects. Considering all the criteria for WPPGIS evaluation is not feasible, as a result, it is recommended to select and modify the list based on each project's needs and stakeholders.

Good participation is a quality of participation which is satisfactory for participants and in line with the objectives of the authorities and participation implementors. Using the list of good participation criteria to design participatory processes is a smart approach to initially starting a practice considering its success factors. That is the best tactic to use the limited resources to gain most of the benefit. Instead of blindly initiate a participatory process, authorities would know what might cause failure and what might guarantee the success of their projects. Furthermore, the public can trust easier to authorities who know what they are doing and why.

Research objectives[1]

This thesis is an attempt to structure components of good participation in an evaluation framework. The framework can be used as a guideline to design web-based PPGIS[2] projects that follow principles of good participation. A well-crafted WPPGIS, then consistently continues to follow the principles of good participation during its implementation and final phase of decision-making. While there is no standard manual for good public participation, the author has attempted to create the evaluation framework by reviewing relevant literature and integrating quality criteria of EParticipation[3] (online participatory systems) and traditional participatory decision-making approaches.

The main reason behind extracting good participation criteria is distinguishing the components of a good WPPGIS. It means it is reverse engineering finding what are the criteria of good participation to propose how to design a WPPGIS in a way to fulfill those criteria. However, there is no intention to practically evaluate the quality of any case study. Also, it is an opportunity to clarify existing gaps in the design and implementation of participatory projects.

[1] The structure and format of the research proposal has been borrowed from Tang, 2006.
[2] Online PPGIS, Web-based PPGIS, WebGIS and Internet-based PPGIS are used interchangeably.
[3] ICT-supported participation in governance and decision-making.

The final list of criteria is a suggestion and not a manual. It means each participatory project might consider certain criteria due to the objectives, target groups, and resources of the project. In this way, participants and authorities in each project can contextualize their own definition of what constitutes good participation for that specific project.

Approaches to the research

➢ **Literature review** centres around relevant research on the principles of good participation, the prerequisites and constraints of online participation and evaluation approaches and frameworks of effective public participation using technologies such as GIS.

➢ **The critical analysis** reviews the collected criteria and decides whether they are applicable for the evaluation of good participation in WPPGIS. However, the research attempts to be inclusive and include most of the proposed criteria with the hope that they might be applicable for certain projects and situations based on the implementers' decision. By highlighting the strengths and existing gaps in the implementation and evaluation of participatory projects, this thesis aims to reframe the participation evaluation to be more inclusive and adaptable.

➢ **The evaluation framework** is a comprehensive list of the available criteria with their proposal justification. It has been attempted to briefly explain what quality is referred to each criterion and why such element is important for good participation. Furthermore, an approach has been recommended at the end on how to frame good participation around the flow of information and roles of the participants in relation to information and how to use the criteria to figure out the gaps and necessary actions.

The scope of the research

The main focus of the current research is on quality of public participation of WPPGIS projects. It is intended to clarify the determining factors that influence the quality, effectiveness, and success of a web-based participatory decision-making system such as WPPGIS. While there are ample studies on technological and institutional requirements of effective web-based participation, this thesis has excluded those aspects from the proposed evaluation framework.

Other assumptions for the present research include:

➢ Online and conventional public participation are mutually inclusive and complement each other. As the result, instead of focusing on the quality-related components of online participation in WPPGIS, the research has included both online and offline quality criteria, simultaneously.

➢ Based on the majority of the available literature on the quality of participation, the main focus of the current framework is limited to urban settings. It is recommended to further investigate rural-appropriate participation methods and access constraints to modify the evaluation framework to adapt for rural settings.

➢ Part of the literature review focuses on the effective participation methods for public participation. While applying effective tools and methods is a determining factor in developing good participation, the current research does not investigate application mechanisms of those methods for effective public participation.

➢ While socio-demographic characteristics of the participants influence the quality of the participation, this research has not included the specific needs of disabled community members in the design and implementation of good participation.

➢ Issues related to access, technical designs, software compatibility, and usability are not on the scope of this research.

Research significance

The main hypothesis behind the current research is investigating the importance of careful design of a participatory project with good participation components in performing a good WPPGIS. The proposed framework is applicable to any web-based spatially-related collaborative decision-making system.

Emphasis on the role of participants in initiation, design, and implementation of a good WPPGIS is a good starting point to invite public to act as the main initiator of participatory projects. Furthermore, by including diverse terms that are used referring to the similar concept, this thesis is inviting further investigation of standardization of the definition of a good, proper, effective, or successful participation.

There are several uncontrollable or unrecognizable variables that can impact the quality of offline and online participation which are not main consideration of this research.

Organization of the thesis

This thesis consists of literature review, evaluation, methodology, and conclusion. Through literature review, this thesis frames a detailed picture of GIS, PPGIS, WPPGIS, EParticipation, relevant methods, benefits, and applications. By reviewing cases of participation evaluation, the research attempts to clarify the determining factors of good participation. The discussion is followed by methodology and list of good participation criteria. After presenting framework, a brief application schema (prototype) has been explained along the final conclusion.

Literature review

The public

The public has different meanings based on where and how it has been applied, which is a *"situational definition"* (Vasquez & Taylor, 2001, p.141, as cited in Public, 2018). The main difficulty of reaching to a standard definition of the public is because it is a *"constantly-shifting concept"* (Creighton, 2005, p. 23). As a result, participatory projects lack a standard and specific definition of the public (Schlossberg & Shuford, 2005, p. 15). Instead of a precise definition, studies attempt to determine roles of the public in decision-making in different types of the participatory methods (Schlossberg & Shuford, 2005, p. 15). In an example, Sandman (1993) listed the roles of the participants in a community planning project including *"industry representatives, lawmakers, authorities, social or environmental activists, government and planning staff, localities, concerned citizens, experts, and the media"* (Sandman, 1993, p.vi & vii, as cited in Liu, 2007, p. 10).

Beside the typical approaches to define the public based on the available roles and selected participation method, there are examples of the public determination based on the objectives of the participation and characteristics of the target group (Schlossberg & Shuford, 2005, p. 18). Thomas (1995) argued that the public is the source of information for community problems and can impact decision-making. As a result, the public can be defined based on their relation to the power holders and types and amounts of the influence that they might have on the final decisions (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 19). Weiner (2002) called the public *"grassroots community"* without further explanation on the definition and characteristics of the grassroots community (Weiner, Harris, & Craig, 2002, p. 5, as cited in Schlossberg & Shuford, 2005, p. 15).

Definition of the public is a source of several debates, and it seems that each project has their detailed definition of the public, the roles they can accept, functions and the types of relation to the authorities (Schlossberg & Shuford, 2005, p. 18). Sewell and Coppock (1977) believe that the public is those members of the community who are interested in participating in decision-makings about their community and have the right to be engaged (Sewell & Coppock,

1977, as cited in Schlossberg & Shuford, 2005, p. 18). As a result, the very first step of any participatory decision-making is determining who is that *interested community member* (Schlossberg et al., 2005, p. 18). A precise answer to the *"Who"* question is an essential determinant of the types and methods of participation (Schlossberg & Shuford, 2005, p. 18).

To determine the *"Who,"* Schlossberg and Shuford (2005) categorized the public into three groups based on their power and roles in the decision-making process (Schlossberg & Shuford, 2005, p. 18):

➢ A group of the community who are directly influenced by a decision in their community (Sanoff, 2000, as cited in Schlossberg & Shuford, 2005, p. 18);
➢ Those members of a community who are the source of relevant and useful information about their community that can be used to resolve problems (Sanoff, 2000; and Thomas, 1995 as cited in Schlossberg & Shuford, 2005, p. 18); and
➢ The group of the public who have the power status or influencial relationships in their community to influence final decisions (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 18).

Among the many alternative terms that are used to refer to the public including community, stakeholders, neighborhood, localities, audiences, and citizens, the term *stakeholder* is more common (Liu, 2007, p. 9). The widely-accepted definition of stakeholder is provided by Freeman who is a prominent researcher in this field (Liu, 2007, p. 9). Freeman defined stakeholder as *"any group or individual who can affect or is affected by the achievement of the organization's objectives."* (Freeman, 1984, as cited in Liu, 2007, p. 9).

Most of the attempts to define stakeholder are limited to a non-specified definition that misses explaining how an issue in their community influences stakeholders or how they might influence the final decision (Liu, 2007, p. 17). Stakeholder determination is a non-straight process and needs close consideration of its specific requirements (Liu, 2007, p. 17). Rietbergen-McCracken and Narayan-Parker (1998) recommended to try to answer to 5 questions to determine any decision-making's relevant stakeholders and clarify who should be involved in the

participation (Rietbergen-McCracken & Narayan-Parker, 1998, as cited in Schlossberg & Shuford, 2005, p. 19):

- ➢ Who might benefit from participatory decision-making?
- ➢ Who might negatively be affected by an issue in the community, or from the public exclusion in the decision-making?
- ➢ Who are the less powerful, marginalized and isolated groups who have had fewer opportunities to express themselves?
- ➢ Who supports and who is in opposition to a potential decision?
- ➢ Have stakeholders' links and interactions been identified clearly?

In a model that was applied by Thomas (1995), stakeholders were determined based on having useful information for the project or having the power and relation to influence the decisions. The model was called the Effective Decision Model (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 19). However, this model is ignoring the impacted groups that neither have the knowledge nor have the power in decision-making in their community. As a result, this method pushes the marginalized groups further to the corners (Schlossberg & Shuford, 2005, p. 19).

Creighton (1983) combined several criteria to determine stakeholders (Creighton, 1983, as cited in Schlossberg & Shuford, 2005, p. 20):

- ➢ Spatial relation of the stakeholders with the impacted location;
- ➢ Whether the participants and stakeholders have any financial benefit from the community that has raised an issue;
- ➢ Is the resource or facility accessible to all and if not, who are restricted?
- ➢ Investigation of social relations and conditions of the public, for instance, whether there is any isolated or threatened culture?
- ➢ What are the impact of the decision-making on social values or norms in that community? Who are bonded to particular religious or cultural traditions?

Stakeholders either are self-selected or staff and third-party selected (Willeke, 1974, as cited in Schlossberg & Shuford, 2005, p. 19). Self-selected stakeholders, identify themselves as

stakeholders and are interested in participating in the decision-making (Willeke, 1974, as cited in Schlossberg & Shuford, 2005, p. 19). Authorities might have specific information about demographic characteristics of the public or their historical background to select specific groups as stakeholders (Schlossberg & Shuford, 2005, p. 19). Selected or introduced stakeholders can extend the list of stakeholders and introduce more people who they know might be interested or should be involved in the decision-making (Schlossberg & Shuford, 2005, p. 19). Schlossberg & Shuford (2005) argue that stakeholder participation in decision making might be challenging because (Schlossberg & Shuford, 2005, p. 19):

- The role of the stakeholder is not a fixed position in a community and might change for several reasons (Aggens, 1983; Mitchell, Agle, & Wood, 1997, as cited in Schlossberg & Shuford, 2005, p. 19);
- Depending on the target group and specific situation of the project, the stakeholders might be determined based on their location, economic status, education, and occupation, or their political orientations (Creighton, 1983, as cited in Schlossberg & Shuford, 2005);
- The central power that decides who should be involved and who is a stakeholder is authorities who may have different desires and intentions in that regard (Thomas, 1995, as cited in Schlossberg & Shuford, 2005); and
- Differences among capabilities and intensity of the interest of stakeholders to participate in decision-making create different levels of stakeholders, as well (Aggens, 1983, p. 189, as cited in Schlossberg & Shuford, 2005, p. 19).

Public participation should be inclusive and plan to include all the interested and affected people (Reed et al., 2009, as cited in Reed, 2008, p. 2423). The challenge of inclusiveness is more problematic when the target group is an isolated or marginalized community (Pain & Francis, 2003, as cited in Richards, Blackstock, & Carter, 2004, p. 13). Inclusiveness influences the quality of the public participation, significantly (Richards, Blackstock, & Carter, 2004, as cited in Reed, 2008, p. 2420). Deciding on the number of participants is another issue, as well (Richards, Blackstock, & Carter, 2004, p. 13). Maintaining the quality of interactions with the participants and at the same time increasing the number of participants requires considering an optimum number of participants which is proper for the specific characteristics of that participatory decision-making (Richards, Blackstock, & Carter, 2004, p. 13). However, in

participatory decision-making which is principally determined by the quality of the interactions between participants and authorities, quality and intensity of exchanging ideas and discussing the views are more important than the number of the participants (Richards, Blackstock, & Carter, 2004, p. 13).

Beside considering inclusiveness as a necessary factor in high-quality participatory decision-making, implementers should consider the diverse motivations behind participation, as well (O'Connor, Schwartz, Schaad, & Boyd, 2000, p. 5). For instance, there are stakeholders who are interested in reaching a specific outcome in the decision-making process, some are marginalized and see the participation as an opportunity to express their opinions, and also some other people might be out of the determined area of the impacted public but are interested in participating for some particular reasons (O'Connor, Schwartz, Schaad, & Boyd, 2000, p. 5).

Stakeholder analysis includes a preparation and implementation process that (Reed & Dougill, 2010, as cited in Reed, 2008, p. 2423):

➢ Determines the scale of social consequences of a decision;
➢ All the impacting factors from human-related to environment-related should be listed as potential stakeholders; and
➢ The participation of diverse stakeholders should carefully be designed and planned before the execution of the process.

In another word, there are different methods for stakeholder analysis that can be used including: determining relevant stakeholders; a clear distinction between different stakeholders and beneficiaries; and identifying the existing relationship among different parties of the project (Reed & Dougill, 2010, as cited in Reed, 2008, p. 2423). Sometimes there is no need for public participation in the stakeholder analysis because the researcher or the authority might have enough knowledge on the potential stakeholders, themselves (Reed & Dougill, 2010, as cited in Reed, 2008, p. 2423). However, there is no guarantee that the knowledge is accurate and complete and at some point, the authorities might need public input (Reed, 2008, p. 2423).

It is the standard assumption of the authorities that stakeholders are usually "*self-evident and self-construed*[4]*" and* therefore skip the stakeholder determination step by only investigating existing stakeholders' concerns (Mitchell, Agle, & Wood, 1997; and Frooman, 1999, as cited in Reed, 2008, p. 2423). However, before further investigation of the concerns of volunteer participants, implementers should determine stakeholders (Reed & Dougill, 2010 as cited in Reed, 2008, p. 2423).

Authorities should gain a comprehensive and in-depth understanding of the social and ecological characteristics of the community to be able to determine the stakeholders (Reed, 2008, p. 2423). The process of adding new people to the list of stakeholders continues throughout the project (Reed, 2008, p. 2423). Nevertheless, it is possible that some of the stakeholders be excluded in the process. (Clarkson, 1995, as cited in Reed, 2008, p. 2423). With all the benefits of executing the maximum inclusiveness, it is not often practical (Reed, 2008, p. 2423).

Precise and manageable definition of the public determines the objective of the public participation (Reed, 2008, p. 2418). Participation can be a complicated process which has a precise definition of the public makes it more feasible (Schlossberg & Shuford, 2005, p. 16). Objectives, goals and expected outcomes then determine the types of participation and the required methods to reach to them (Schlossberg & Shuford, 2005, p. 18). Preferences of the participants also should be considered when deciding on the methods and tools of the participation (Webler & Tuler, 2006, as cited in Reed, 2008, p. 2421). In a study of public preferences in two case studies of elk population issues, Chase, Decker, and Lauber (2004), for example, found out that the public preferred more democratic participatory methods such as open houses. However, public preferences cannot be the only factor determining the methods and tools of participation (Chase, Decker, & Lauber, 2004, p. 636). In some cases that public prefers a particular method, but the authorities find it irrelevant or non-functional, it might be because of the public lack enough knowledge about their selected method that is unable to fulfill the objectives of the participation (Chase, Decker, & Lauber, 2004, p. 636). Also, public might change their opinion about a selected or preferred method in the middle of the process because, for example, the selected method has not been influential as they expected, or they desired more

[4] Based on their own interpretation of the situation

influence than their existing impact in the decision-making (Chase, Decker, & Lauber, 2004, p. 637).

Public participation

One of the convenient definitions of the public participation belongs to the U.S. Environmental Protection Agency (EPA) who publishes guidelines and mandates for public participation. Based on EPA's definition public participation is: *"any process that directly engages the public in decision-making and gives full consideration to public input in making that decision."* (Public participation guide: Introduction to public participation, 2018). As a result, based on EPA's definition, public participation is a process of activities throughout the project that has two main functions: provide information to public about the decision-making opportunity in their community and collect relevant and helpful information from the public as the main source of the information of the community (Public participation guide: Introduction to public participation, 2018). The main function of participatory decision-making is giving voice to the groups who have been ignored most of the time (Smith, 1993, as cited in Tang, 2006, p. 14). However, EPA's definition faces several misunderstanding and misinterpretation due to the very diverse set of terms that are used interchangeably with the public participation. For instance, *"consultation in South Africa," "public management in Brazil,"* and "*co-management in Cambodia"* are all widely-accepted terms to refer to the public participation in different countries (Bonnemann, 2010). Still, the same term might have different meanings for various people (Canadian Environmental Assessment Agency, 2008, Chapter 1, p. 2). For example, participation in political campaigns for people who are socially or politically forced to participate is different from people who have the interest to involve in enhancing the quality of life in their community and participate in its related decision-making voluntarily (Canadian Environmental Assessment Agency, 2008, p. 2).

In any participatory decision-making, regardless of its context and the intention of participants, it is necessary to agree on the definition of participation and how it is going to function in the decision-making (Canadian Environmental Assessment Agency, 2008, p. 2). Nonetheless, it is widely accepted that the public is all the stakeholders except the government (Tang, 2006, p. 15) and the ordinary and expected functions of the public participation is

consensus-building, encouraging cooperation for mutual gaining, and reaching to an acceptable decision for most of the parties (Innes & Booher, 2000, p. 34, as cited in Tang, 2006, p. 15).

If the public does not agree on decisions that are taken for their community, they do not feel responsibility for it. This phenomenon is called NIMBY[5] syndrome (Tang & Waters, 2005, p. 15). However, people mostly prefer to be involved in decision-making for their community and show more of NIMBI[6] behavior (Massam, 1993, as cited in Tang & Waters, 2005, p. 15). Participation advocates promote NIMBI analogy for this reason (Tang &Waters, 2005, p. 15).

There are several public and stakeholder participation types of research that have an essential role in determining the primary direction of this field of study (Reed, 2008, p. 2418). For instance: Participation norm in sustainable development (UNCED, 1992, as cited in Reed, 2008, p. 2418); Weaknesses of a participatory approaches (Cooke & Kothari, 2001, as cited in Reed, 2008, p. 15); Best practices in public participation (Hickey & Mohan, 2005, as cited in Reed, 2008, p. 2418); Educating public on the functions of public participation (van Tatenhove & Leroy, 2003, as cited in Reed, 2008, p. 2418); Roles and responsibilities of localities in participatory data collection (Pretty, 1995, as cited in Reed, 2008, p. 2418); and Reliability and accuracy of local knowledge (Chambers, 1983, as cited in Reed, 2008, p. 2418).

Usually, people introduce themselves as stakeholders voluntarily, and it is a self-claimed status (Mitchell et al., 1997; Frooman, 1999, as cited in Reed, 2008, p. 2423; Willeke, 1974, as cited in Schlossberg & Shuford, 2005, p. 19). However, only when people assume that they have a significant benefit, or a severe threat might jeopardize their stake, they get engaged in the decision-making process (Creighton, 2005, p. 23). The stake can be very different for different situations from economic, resource-related, value or religious-related sensitivities (Creighton, 2005, p. 23). The motivation to participate mostly show up when people find their stake at risk (Creighton, 2005, p. 23). By implementing a situation assessment, authorities can collect information on potentially affected groups and then make an informed decision about who should participate in the decision-making (Public participation guide: Process planning, 2018). The primary objective of the implementers should be collecting as diverse of opinions and

[5] Not In My Back Yard (Webler, & Wiedemann, 1995, p. 27)
[6] Now I Must Be Involved (Massam, 1993, as cited in Tang & Waters, 2005, p. 15)

involve as much as the public, as possible (Public participation guide: Process planning, 2018). Authorities decide about the participation techniques and tools based on their assumed goals, and because they set public participation as a management goal, selected participatory methods clarifies the intention of the authorities, as well (Wiedemann & Femers, 1993, as cited in Rowe & Frewer, 2000, p. 10).

If community members are provided information on the potential impact of a decision, people might take a different approach for self-claiming stakeholders (Creighton, 2005, p. 23). As a result, the primary requirement of a good community planning is setting proper communication channels for informing and interacting with the public regarding their roles, alternatives and potential risks (Creighton, 2005, p. 23). However, the public would not consider a participatory process successful, unless when it has implemented what they demanded (Public participation guide: Introduction to public participation, 2018). Instead, authorities should incorporate several interests and concerns of the public to maximize the inclusiveness and overcome the marginalization of minorities (Public participation guide: Introduction to public participation, 2018). It is the primary responsibility of the participation initiators or authorities to reach a comprehensive decision that has considered all the different perspectives (Public participation guide: Introduction to public participation, 2018). The final decision then should be shared with the participants to let them understand how their interests and concerns have been considered (Public participation guide: Introduction to public participation, 2018).In practice, public input would influence the decision-making process in a specific stage and only when the collected input can have an impact (Public participation guide: Introduction to public participation, 2018). However, involved public mainly expect of influencing the final decision (Public participation guide: Introduction to public participation, 2018). Whereas participatory decision-making projects most of the time only are looking for consulting the public or informing them on a specific matter in their community (Public participation guide: Selecting the right level of public participation, 2018). As a result, not necessarily all the participatory decision-making requires to include public perspective in the final decisions (Public participation guide: Introduction to public participation, 2018). It is very critical not to ask questions such as what the public want and raise their expectation that their desires and interests are going to be the base for the final decision (Public participation guide: Introduction to public participation, 2018).

When designing a successful[7] participatory process, it is crucially important to consider whether the public is going to have any influence on the decision and if they do, how much? (Public participation guide: Selecting the right level of public participation, 2018). As a principle for participatory decision-making, implementers are responsible for clarifying two matters: what is their purpose of the participation and whether and how public input might be used (Public participation guide: Selecting the right level of public participation, 2018).

Representation of all the diverse interests and opinions in a participatory process is one of the most challenging tasks for authorities (Tang & Waters, 2005, p. 19). For instance, it can not be confidently concluded that the participants of an open house represent the influenced public, because first of all, participants have volunteered to engage in the decision-making and secondly, their demographic characteristics tend to belong to higher socioeconomic status in the community (Mackay, 2004, as cited in Tang & Waters, 2005, p. 19). As a result, even though the open house meetings are assumed to be the most common method of participation, it can not provide a fair inclusion of diverse opinions (Mackay, 2004, as cited in Tang & Water, 2005, p. 19). The same arguments can be made about online participation which its use is highly correlated with the socio-demographic characteristics of the participants (Tang & Waters, 2005, p. 19).

If the primary focus of the decision-making process is zoomed on people who have more power or confidence to enforce their perspectives, the rest of the public feel unrepresented in the process (Creighton, 2005, p. 24). Missing to include the opinions of the less powerful people, increases the chance that they might not accept the final decision (Creighton, 2005, p. 24). Organizing community members and stakeholders in small groups eases the process of reaching to an agreement, however, it opposes the function of the *"group-thinking"* in the decision-making process, because the group might get more concerned about including all the opinions (Janis, 1972, as cited in Brown, 2015, p. 201). Proper representation of diverse views and different participants is more important than the number of the involved people in the decision-making (Creighton, 2005, p. 24). Participating is people's choice, but if they are excluded from decision-making while they wanted to be included, can significantly impact the quality of the

[7] A possible synonym to *good* participation process

decision-making (Creighton, 2005, p. 24). In the planning and design phase of any efficient, participatory decision-making, authorities should decide about the roles of the stakeholders in the process and how they are going to influence the outcomes (Schlossberg & Shuford, 2005, p. 18).

There are three fundamental reasons for involving public in decision-making (Stirling, 2008, as cited in Wickson, Delgado, & Kjolberg, 2010, p. 757). Firstly, public and involved to achieve some predefined goals such as public awareness about an issue in the community which is called *"instrumental rationale"* (Stirling, 2008, as cited in Wickson, Delgado, & Kjolberg, 2010, p. 757). When the public is actively motivated to participate, and the authorities' primary attempt is to include all stakeholders to achieve better decisions, the rationale behind participation is *"substantive"* (Stirling, 2008, Wickson, Delgado, & Kjolberg, 2010, p. 757). Finally, when authorities implement public participation to promote democracy and provide opportunities for diverse people to involve in deliberative discussions without particularly planning to reach to any specific result, the rationale behind the participation is *"normative"* (Stirling, 2008, Wickson, Delgado, & Kjolberg, 2010, p. 757). Wickson, Delgado, and Kjolberg (2010) noted that there might be the fourth rationale behind participation when people feel the responsibility to have a role in the well-being of their community, even though they are not considered stakeholders, haven't been contacted or they have no direct benefit or influence from the decision (Wickson, Delgado, & Kjolberg, 2010, p. 757). Based on this justification, people want to participate because they have a strong sense of community belonging (Wickson, Delgado, & Kjolberg, 2010). Such members of the community receive information from authorities and get informed about the issue but feel responsible for informing others actively and educate them on their rights and available alternatives (Wickson, Delgado, & Kjolberg, 2010, p. 758).

Implementers of any participatory decision-making might have diverse goals including informing the public, checking with the public on specific issue or available alternatives, necessitate the public to engage in the decision-making or team up with the public to identify solutions, and empower public to make final decisions (Schlossberg & Shuford, 2005, p. 17). As a result, participation implementers use different tools and techniques to inform people,

investigate public's opinions, assess the possibility and techniques of reaching to consensus[8], and commit people to an agreed decision (Reed, 2008, p. 2424). Selecting and applying the most suitable tools and techniques would have a significant impact on the quality of the decision-making, as well (Ambrose, 2013, p. 3).

'*Ladder of Citizen Participation'* (Arnstein, 1969), is one of the most prominent theories in the field of public participation which outlines participation based on the degree of authority and control. Based on her analogy, citizen participation includes *"the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future."* (Arnstein, 1969, p. 216, as cited in Schlossberg & Shuford, 2005, p. 16). Arnstein (1969) firmly believed that participation is an empowering tool for ordinary citizens (Schlossberg & Shuford, 2005, p. 17). In Arnstein's ladder, level of engagement and power has a positive correlation. For instance, when the authorities manipulate citizens and consider the least amount of power for them to control decisions, the citizens are positioned in the lowest level of the ladder (Reed, 2008, p. 2419). By increasing power, people get more engaged, gain more knowledge and on the optimum level, on the high level of the ladder, they have the power to control decisions independently (Reed, 2008, p. 2419; Schlossberg & Shuford, 2005, p. 17). Opportunities for participation increases as people gain more power to influence decisions and move up to the higher levels of the ladder (Tang, 2006, p. 17).

Different names have been used by others for each step of the Arnstein's Ladder (Pretty, 1995; Goetz, Gaventa, & Cornwall, 2001, as cited in Reed, 2008, p. 2419). For instance, Biggs (1989), assumed that type of relationships in the Ladder of Participation varies from *"contractual, consultative, collaborative, and collegiate."* (Biggs, 1989, as cited in Reed, 2008, p. 2419). Farrington (1998) classified participation based on the functions of participation that might be *"consultative, functional, or empowering"* (Farrington, 1998, as cited in Reed, 2008, p. 2419). Lawrence (2006), suggested "*transformative"* participation that can ideally empower

[8] Defined by Susskind (1999) as *''a process of seeking unanimous agreement. It involves an effort to meet the interests of all stakeholders. Consensus has been reached when everyone agrees they can live with whatever is proposed after every effort has been made to meet the interests of all stakeholder parties''*. (Susskind, 1999, p. 6, as cited in Reed, 2008, p. 2424).

communities throughout the process of participation (Lawrence, 2006, as cited in Reed, 2008, p.2419).

Connor (1988) uses the Ladder of Participation to frame conflict resolution in participatory decision-making (Connor, 1988, p. 250, as cited in Schlossberg & Shuford, 2005, p. 17). His framework which is designed for *"preventing and resolving public controversy"* in confrontational decision-making, describes different techniques such as public awareness and conflict prevention to resolve arising issues throughout participation process (Connor, 1988, p. 250, as cited in Schlossberg & Shuford, 2005, p. 17).

Wiedemann and Femers (1993) focus on the requirement of public participation in government organizations where the engaging public in decision-making is compulsory to their projects (Wiedemann & Femers, 1993, as cited in Schlossberg & Shuford, 2005, p. 17). However, there is no precise definition of who is the public and what are the procedures for their participation (Schlossberg & Shuford, 2005, p. 17). In Wiedemann and Femers' extended classification, public participation can range from *"right to know, informing, right to object, defining interests, determining agenda, recommending solutions and participation in the final decision"* (Weidemann & Femers, 1993, as cited in Schlossberg & Shuford, 2005, p. 17). Likewise, Dorcey (1994) reframed public participation as a constant interaction between the public and authorities (Dorcey, 1994, as cited in Schlossberg & Shuford, 2005, p. 17). Dorcey (1994) then argues that the degree and type of participation changes from a primary and simple advocacy of a problem to a more intense engagement of the public (Dorcey & British Columbia Round Table on the Environment and the Economy, 1994, as cited in Schlossberg & Shuford, 2005, p. 17). Consequently, Dorcey (1994) claims that the public participation cannot be similar throughout the participatory process and can change (Dorcey & British Columbia Round Table on the Environment and the Economy, 1994, as cited in Schlossberg & Shuford, 2005, p. 17). Furthermore, appropriate techniques for each stage of the participation is different (Dorcey & British Columbia Round Table on the Environment and the Economy, 1994 as cited in Schlossberg & Shuford, 2005). Warner (1997) considered consensus-building as the primary goal of participation and researched participatory methods to see how they may achieve this goal (Warner, 1997, p. 417, as cited in Reed, 2008, 2420).

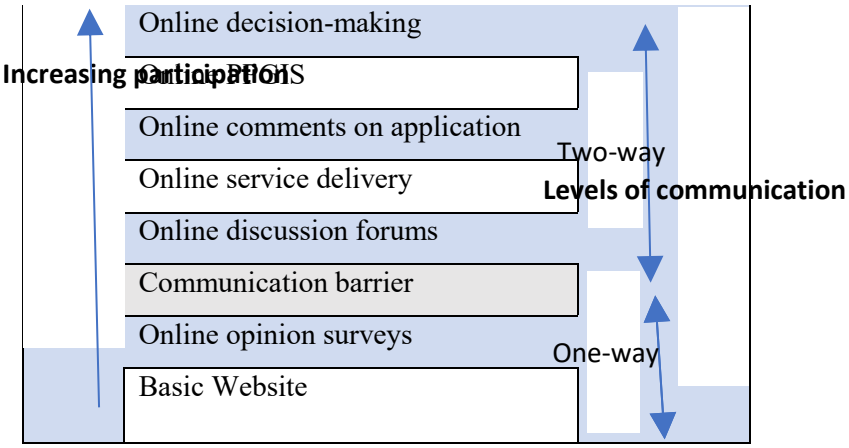
Communication and type and direction of the flow of information was the base for Rowe and Frewer's (2000) participation framework (Rowe & Frewer, 2000, p. 6). In their framework, authorities transfer information to participants in lower levels of the ladder without participants having any impact on the information or interact with the authorities. Reaching higher in the ladder changes the flow of the information to a two-way flow that participants take the roles of negotiators and consultants and act as providers of information and are capable of implementing the final decisions, as well (Rowe & Frewer, 2000, p. 6).

Ladder of participation generates an assumption that the higher levels on the ladder are better in regard of participation and influence on decision-making (Arnstein, 1969; Johnson, Lija, Ashby, & Garcia, 2004, as cited in Reed, 2008, p. 2419). However, due to the significant differences between effective methods for specific objectives, required methods for engaging different target groups, types of participation, and the capacity of the participants involving in the decision-making process, this can not be true (Richards, Blackstock, & Carter, 2004; Tippett, Handley, & Ravetz, 2007, as cited in Reed, 2008, p. 2419). To illustrate how all the levels of the Ladder are essential for participatory decision-making, Davidson (1998) introduced *'the wheel of the participation.'* (Davidson, 1998, as cited in Reed, 2008, p. 2419). All the different classifications of the participation are similar in the fact that intensity and level of engagement are very dependent to the access to information, type of information and whether people influence the final decisions (Tulloch & Shapiro, 2003, as cited in Schlossberg & Shuford, 2005, p. 16).

Most of the instances of public participation functions are limited to the permit to question the authorities' decisions or *"right to object"* (Sadagopan, 2000, as cited in Tang & Waters, 2005, p. 20). However, the progress in communication technologies such as Internet has improved the quality of participation in the Ladder of participation (Tang & Waters, 2005, p. 20). The Internet can enhance the access of the participants to accurate and updated information (Liu, 2007, p. 2). Also, Internet can assist implementers to increase the inclusivity of their program by conveniently and reasonably increasing the number of participants (Liu, 2007, p. 2). Due to the positive functions of the Internet for participation, Kingston (2002) proposed an EParticipation Ladder (Table 1) (Kingston, 2002, as cited in Tang & Waters, 2005, p. 20). In the EParticipation Ladder, communication and information flow is determinant of the type and

intensity of the participation. Lower levels of the Ladder belong to online government services such as community planning website which is government-owned and applies tools such as a static and informative website to transfer information to the community through a one-way flow of information (Tang & Waters, 2005, p. 20). Upper levels of the Ladder transform to a two-way flow of information and is based on interactive communication. In two-way communication, participants and implementers' roles as a source of information or consumer changes constantly (Carver, 2001, as cited in Tang & Waters, 2005, p. 20).

Table 1 EParticipation Ladder (Kingston, 2002, as cited in Tang & Waters, 2005, p.20)



There are many studies in the field of public involvement including research on diverse topics of participation definition, various classifications, methodologies, and theories (Schlossberg & Shuford, 2005, p. 18). However, lack of a precise determination of participation objectives in any participatory decision-making might trigger misleading expectancy amongst practitioners and participants about what they might achieve through their particular involvement (Schlossberg & Shuford, 2005, p. 18). Furthermore, objectives are the primary determinant of the type of participation methods, stakeholders, and evaluation methodology (Schlossberg & Shuford, p. 18). As an example of a practical implication of such classifications, Dorcey's (1994) analogy for the Ladder of participation for PPGIS could be that PPGIS is an opportunity for continuous engagement in planning (Dorcey, 1994, as cited in Schlossberg & Shuford, 2005, p.

18); Arnstein could develop his Ladder of participation for PPGIS to conclude that PPGIS is an opportunity for public to gain significant power over decisions that are made for their community (Arnstein, 1969, as cited in Schlossberg & Shuford, 2005, p. 18); and Conner's (1988) could believe that PPGIS is a tool to prevent and resolve conflict (Connor, 1988, as cited in Schlosberg & Shuford, 2005, p. 18).

There are no agreements on the applicability of public participation for diverse matters (Bonnemann, 2010). The widely used definition of the public participation actively builds the assumption that public should be involved only in decision-making or political campaigns (Bonnemann, 2010). Such limitation in the definition would exclude activities related to responsible citizens, crowdsourcing, citizen reporting, and Google Map's updating of addresses and information (Bonnemann, 2010). While the application of the public participation has outgrown beyond the traditional definition of the public participation, its definition should adapt the new changes (Bonnemann, 2010). For instance, based on the more flexible and adaptable new definition, normative rationale of participation that was proposed by Stirling (2008) can be interpreted as the engagement for promoting democracy rather than involving making specific decision (Stirling, 2008, as cited in Wickson, Delgado, & Kjolberg, 2010, p. 757).

Benefits of public participation in decision-making

If authorities and people in power implement transparent public participation processes, they can achieve significant public trust (Richards, Blackstock, & Carter, 2004, as cited in Reed, 2008, p. 2420). With clear objectives of the participation and what authorities are intended to reach, participants are more willing to support the achieved results (Public participation guide: Introduction to public participation, 2018). Furthermore, when participants are informed about the project and its issues and involve in the decision-making, they can actively participate in *"co-generation of knowledge"* which is an empowering activity (Greenwood, Whyte, & Harkavy, 1993; Okali, Sumberg, & Farrington, 1994; MacNaughten & Jacobs, 1997; Wallerstein, 1999, as cited in Reed, 2008, p. 2420).

Involvement in participatory decision-making helps people to gain analyzing the capability of conflicting community issues, learn communication and negotiation skills with authorities and practice consensus-building techniques (Tang & Waters, 2005, p. 18).

Sultana and Abeyasekera (2007) compared various management methods of community-owned fisheries in Bangladesh and found out that public participation triggers better management. By enhancing communication, participation can potentially decrease disagreement cases among stakeholders (Sultana & Abeyasekera, 2007, as cited in Reed, 2008, p. 2421). Beierle (2002) investigated 239 cases of public engagement and found out that participation has made decisions more comprehensive by improving the quality of available information in the decision-making process (Beierle, 2002, as cited in Reed, 2008, p. 2421). The synergy of accumulating information and creative ideas in participatory decision-making increases the possibility of reaching to a mutual understanding of problems and cooperating in solving issues through *"collective intelligence"* (Levy, 1997, p. 13, as cited in Brabham, 2009, p. 247).

When people are involved in the process of decision-making and see how their opinions have influenced the final decisions, they can validate and accept the final decisions (Cupps, 1977; Turner & Weninger, 2005, as cited in Reed, 2008, p. 2424). Furthermore, authorities can ensure that if they build the final decisions based on the information of local people the final decisions are more sustainable because it is in harmony with local and cultural preferences. Also, authorities can be sure that their decisions are taken with the comprehensive and accurate information on preferences and restrictions of local neighborhoods (Mansourian, Taleai, & Fasihi, 2011, p. 274). Initiating engagement from the early stages of the project, gives the chance to authorities and implementers to confront the possible conflicts and problems early in the project and decrease the possibility of those issues impacting the quality of participation (Federal Highway Administration, 2003, as cited in Tang & Waters, 2005, p. 14).

When authorities do all their efforts to implement inclusive, participatory decision-making and provide opportunities for all the diverse interests to express their opinions, people are more willing to support the final decision, even if it is not what they desired to happen (Creighton, 2005, p. 10). The conditions when participants agree on a solution or alternatively different from their interest is called *'informed consent'* and is an ideal situation for conflicting decisions (Bleiker & Bleiker, 1994, p. I-7, as cited in Creighton, 2005, p. 10).

Public participation will help the authorities to make more appropriate decisions that echoes the priorities of the community (Public participation guide: Selecting the right level of

public participation, 2018). Such decision is more acceptable and comprehensible to the public (Public participation guide: Selecting the right level of public participation, 2018). In effective decision-making, the issue should be investigated carefully and clarified for the community (Public participation guide: Selecting the right level of public participation, 2018). In this way, the community would have a clear understanding of the pros and cons of their decisions and can participate in decision-making with all the unbiased and essential information (Public participation guide: Selecting the right level of public participation, 2018). The first step in any participatory project is determining goals and clarifying intentions for participation (Public participation guide: Introduction to public participation, 2018). Also, implementers should honestly explain how participants' input may be used in the decision-making and whether they can have any impact on the final results (Public participation guide: Introduction to public participation, 2018).

Among the many benefits of public participation, it is imperative that participatory decision-making help to avoid marginalizing lower voices, outsiders, and less powerful stakeholders (Reed, 2008, p. 2420). There might also be the possibility of creating new linkages and mutually learning by interactions throughout the participation process (Blackstock, Kelly, & Horsey, 2007, as cited in Reed, 2008, p. 2420). When people find out about the needs and limitations of other community members, sense of belonging to the community encourages them to change the way they would interact with other community members (Reed, 2008, p. 2420). Ideally, they would have more respect to others even to the opposite opinions (Forester, 1999; Pahl-Wostl & Hare, 2004; Leeuwis & Pyburn, 2002; and Stringer et al., 2006, as cited in Reed, 2008, p. 2420).

When people are engaged in the decision-making as a source of information and knowledge providers, quality of the decision-making is higher, as well (Hansen, 1994; Reed, Fraser, & Dougill, 2006; Reed, Dougill, & Baker, 2008, as cited in Reed, 2008, p. 2420). On the other words, if decision-making is implemented through engaging the public, they can create better decisions, while these decisions are made after acquiring more profound and more extensive information. In this way, decision-makers can foresee and improve sudden, and disagreeable outcomes before their occurrence (Fischer, 2000; Beierle, 2002; Koontz & Thomas, 2006; Newig, 2007; and Fritsch & Newig, 2012 as cited in Reed, 2008, p. 2420).

It is essential to be aware of local interests, needs, and preferences at the participation design phase to make more compatible procedure and guarantee the satisfaction and support of the stakeholders at the end (Dougill et al., 2006, as cited in Reed, 2008, p. 2420). By creating a shared sense of ownership and agreement between participants and emphasising on the importance of respecting others' viewpoints in a participatory decision-making, the public can transform behaviors that damages the sense of community and start to seek for some new tools and communication channels to strengthen more efficient relationships with other members of the community and stakeholders (Stringer et al., 2006 as cited in Reed, 2008, p. 2420). When localities are involved in the decision-making and their opinions have had impacts on the final results, their sense of ownership of the decision, not only enhances the quality of the decision-making, but also the result would be more durable and sustainable (Richards, Blackstock, & Carter, 2004, as cited in Reed, 2008, 2420).

Methods of public participation

Based on the level and type of participation, practitioners decide about the proper participation method (Reed, 2008, p. 2424). Tang (2006) analyzed the Ladder of participation about some of the famous participatory methods and concluded that it is prevalent for all of the methods to at least inform the public and disseminate information (Tang, 2006, p. 22). Tang (2006) classified participatory methods to conventional and modern (Table 2).

Table 2 – Participation methods and popular examples (Tang, 2006, p. 3)

Conventional participation	**Modern participation**
Opinion surveys[9]	Simple websites
Neighbor notification	Online discussion forums
Exhibitions	PPGIS[10]
Consultation documents	
Written comments	
Public meetings	
Consultation forums	
Citizen advisory committees	

[9] Opinion surveys could be online, as well.
[10] It can be a part of a traditional participation or modern and web-based.

The exemplified methods are different in many aspects, but they are similar in integrating local and technical knowledge (Tang, 2006, p. 24). Such integration is an attempt to decrease or eliminate the distance between *"them and us"* (Tang, 2006, p. 24). Regardless of the selected method, the primary objective of participatory decision-making is providing an opportunity for mostly neglected or ignored groups to have a say in their community planning, rather than considering community planning as a privilege for the elites or a technical topic that can only be comprehended by a scientist (Tang, 2006, p. 24). However, still, authorities and participation organizers need to decide what methods of participation would help them to reach the predefined goals (Reed, 2008, p. 2424). For instance, Tang (2006), criticizes cases that the government holds public meetings to legitimize the authorities' development proposal. As a result, conducting a participatory meeting in community development not necessarily follows liberal goals (Tang, 2006, p. 24). This prescribed, enforced participation, or *"restricted participation,"* (Carver, Kingston, & Turton, 1998, as cited in Tang, 2006, p. 24) cannot meet the requirements of a real and deliberative participatory decision-making or *"principles of participatory planning."* (Rittel, 1972 as cited in Tang, 2006, p. 37).

Moreover, after selecting the method for participation, level of participation and potential impact of the participation on final decisions should be determined (Public participation guide: Selecting the right level of public participation, 2018). Selection of the level of participation can be made by clarifying the authorities' intention for public engagement (Public participation guide: Selecting the right level of public participation., 2018). For instance, International Association of Public Participation (IAP2) introduced the Spectrum of Public Participation. The principle of this Spectrum is determining how much impact can be expected for which level of engagement. The impacts vary from no impact when participants are involved only by providing information, to maximum impact when participants are capable to independently make decisions (empowered) (Public participation guide: Selecting the right level of public participation, 2018). Level of engagement is not related to the success of engagement or satisfaction from the participation. Quality of participation can vary based on the level of engagement, type of methods, target groups, quality of implementation and expected the level of engagement by the participants and is not guaranteed (Public participation guide: Selecting the right level of public

participation, 2018). Level of engagement throughout the whole process of the decision-making might be different, as well (Public participation guide: Selecting the right level of public participation, 2018). However, implementing higher levels of participation requires more energy and effort from the authorities which might be a reason to limit the number of the participants (Public participation guide: Selecting the right level of public participation, 2018). Also, a higher level of participation is needed in upper rungs of the Ladder of participation. As the resulting intensity of participation is correlated with the level of participation in the Ladder (Public participation guide: Selecting the right level of participation, 2018). Level of engagement is also part of the participants' choice, as well. For instance, some of the participants might select to only involve at the less time-consuming level of involvement such as attending in public meeting to acquire information about the project and get informed (Public participation guide: Selecting the right level of participation, 2018). It is also possible that the selected level of participation has been inevitable, and stakeholders have not had enough knowledge on the available opportunities for participation such as a group of vulnerable community members (homeless people) (Public participation guide: Selecting the right level of participation, 2018).

The relation between types of participation methods and public's characteristics has been studied by several researchers (Schlossberg & Shuford, 2005, p. 15). Thomas (1995) framed the relationship between the public and participation method in a matrix (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 21). Based on Thomas's matrix, there are different *"decision-making styles"* that are proper to be used for different groups in a community (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 21). Similarly, Konisky and Bierle (2001) made the connection between types of participation and participants (Konisky & Bierle, 2001, as cited in Schlossberg & Shuford, p. 21). However, their matrix also provided information on how practitioners can expect particular outcomes based on these connections (Konisky and Bierle, 2001, as cited in Schlossberg & Shuford, 2005, p. 21). Jackson (2001) created a guideline based on participation objectives for planners to decide about their participatory initiative (Jackson, 2001, as cited in Schlossberg & Shuford, 2005, p. 21).

Clarity of the goals and objectives is an essential determinant of who is going to participate and how (Reed, 2008, p. 2424). Furthermore, planners and authorities would have better measurement tools to assess the success and failure of their project when the objective of

the participation is determined (Roberts, 2004, p. 334). For instance, Schlossberg & Shuford argue that a project might choose to disseminate information in a map format in the community to *"educate the public by representing complex data in map form with the hope that more citizens will become part of the public debate."* (Schlossberg & Shuford, 2005, p. 21). In another example Schlossberg and Shuford exemplify the main objective of implementing PPGIS *"to develop increased social networks in specific neighborhoods using community-based, GIS oriented data gathering."* (Schlossberg & Shuford, 2005, p. 21).

After reviewing several participation matrixes, Schlossberg and Shuford (2005) concluded the results in their matrix of public and participation types. They categorized the public in a horizontal spectrum-type of axis ranging from simple to complex public (Table 3) (Schlossberg & Shuford, 2005, p. 22). Simple or complex public based on their contextualization are different in size and convenience to engage (Schlossberg & Shuford, 2005, p. 21). The difficulty of engaging the broader public with less-clearly defined limitations are related to financial and practical challenges (Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 22). Furthermore, Schlossberg and Shuford (2005) extended the categorization of public participation and put participation on a vertical axis ranging from simple to complex participation (Schlossberg & Shuford, 2005, p. 23). Simple and complex participation are different regarding its communication type, expected outcomes, objectives, and convenience of implication (Schlossberg & Shuford, 2005, p. 23). Schlossberg & Shuford's (2005) matrix is an attempt to provide a practical guide for participation implementers to use it in selecting their proper participation type for a specific public. The matrix is flexible, and the proper participation type can change during the implication based on the needs of the project (Schlossberg & Shuford, 2005, p. 22).

Table 3 Matrix of public and participation (Schlossberg & Shuford, 2005, p. 23)

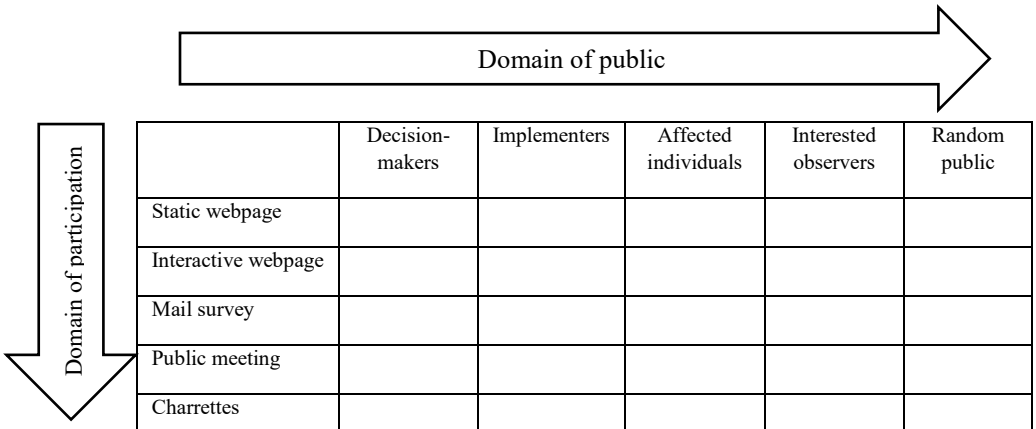
Domain of public

Domain of participation

	Decision-makers	Implementers	Affected individuals	Interested observers	Random public
Inform					
Educate					
Consult					
Define issues					
Joint plan					
Consensus					
Partnership					
Citizen control					

Schlossberg and Shuford (2005) later provided an alternative to the participation matrix which focused on participation techniques rather than participation objectives (Table 4) Schlossberg & Shuford, 2005, p. 24). Similarly, participation techniques were categorized based on their communication type and relation to the objective of the primary participation (Schlossberg & Shuford, 2005, p. 24). For instance, the static webpage is a one-way communication tool that is merely proper to inform the public (Schlossberg & Shuford, 2005, p. 24). On the other side of the spectrum, implementers might find developed and interactive websites that provide a two-way flow of information and are excellent opportunities for participants to interact and ideally reach to consensus in their collaborative decision-making (Schlossberg & Shuford, 2005, p. 24).

Table 4 Matrix of participation techniques (Schlossberg & Shuford, 2005, p. 24)



	Decision-makers	Implementers	Affected individuals	Interested observers	Random public
Static webpage					
Interactive webpage					
Mail survey					
Public meeting					
Charrettes					
Citizen juries					
Collaboration					

Participatory community planning

Hodge and Gordon (2014) defined community planning as *"the process of a community deciding upon its future environment"* (Hodge, 2003, as cited in Tang, 2006, p. 11). Through community planning process, the public discusses different objectives and finally reaches to a common objective which is called *"public interest"* (Tang, 2006, p. 11). While the existence of various interests in a community is inevitable and fair representations of all of those diverse interests is challenging, Tang (2006), suggests community planning as a solution for this challenge (Tang, 2006, p. 14). As a result, it can be concluded that community planning is an attempt to consult affected community members for the potential solutions of the planning issues (Tang, 2006, p. 14).

Participatory planning is the integration of professional and local knowledge in the decision-making (Tang, 2006, p. 14). Community planning requires a medium that facilitates discussions and sharing of ideas among community members and planners (Tang, 2006). This medium should aim to facilitate reaching an agreement on the existing problem and collaborating for solving planning issues (Tang, 2006, p. 14). The selected medium in the community planning should provide an accessible communication channel for exchanging information and making informed decisions (Tang, 2006, p. 14). Community planning cannot be very determined and precise because community issues are multi-dimensional and can transform over time (Tang,

2006, p. 12). Furthermore, public's opinion can change over the lifespan of a community planning project, and as a result, participatory community planning needs to be designed and managed based on changing issues and interests of the participants (Richards, Blackstock, & Carter, 2004, as cited in Reeds, 2008, p. 2425).

There are several analogies for participation and non-participation in community planning (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Jankowski, Czepkiewicz, Mlodkowski, Zwolinski and Wojcicki (2017) studied the two prominent community planning arguments: normative and rationalist. The normative reasoning behind participation in community planning is the need for keeping democratic qualities in the development which is directly influenced by engaging public in decision-making (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Based on this rationale, the involvement of the public would result to better and more acceptable decisions for the community that is a fair representation of their preferences and values (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). On the side, many researchers think that technical and scientific knowledge on community planning needs to be legitimized by the public through discussions (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Validating a technical decision with public's preferences and restrictions would make it more sustainable and practical (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2).

During the 1990s, the dominant theory about planning was considering community's interests, open discussions on plans, cooperative learning, and participatory decision-making (Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 7). As a result, planners included participation as a principle in community planning (Lane, 2005, as cited in Ambrose, 2013, p. 7). The shifted theory of collaborative planning was reflected in different approaches and organizational goals. For instance, based on the bylaw of the American Planning Association (APA), community planners should emphasize on engaging the public in planning and serve their priorities (American Planning Association, 1992, as cited in Ambrose, 2013, p. 7). Furthermore, American Institute of Certified Planners (AICP) applied the public participation principle to extend its legal mandate which states there should be an ongoing discussion on the public's interests, constraints and priorities (American Planning Association, 2005, as cited in

Ambrose, 2013, p. 8). Making relevant information accessible to the public, makes their contribution in the decision-making meaningful (American Planning Association, 2005, as cited in Ambrose, 2013, p. 8). Involvement planning should be inclusive and open to all interested parties or whomever who is going to be impacted by the proposed development (Ambrose, 2013, p. 8). Involvement of the public in the planning should be open to all the community members, and whoever that decides to engage or is impacted by the decisions should be invited to participate (Ambrose, 2013, p. 12).

Based on Davidoff's (1965) *"Advocacy planning theory"* public participation regardless of its results in the planning should be an objective for any decision-making (Lane, 2005, as cited in Ambrose, 2013, p. 7). Laurian and Shaw (2008) outlined the evolution in planning theory starting with Friedman's (the 1970s) *"Transactive planning model,"* which mainly insisted on direct and interpersonal interactions. Afterward, *"Communicative"* and *"public participation"* theories were applied to the 1980s' and 1990s' planning projects (Lane, 2005; Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 7).

The primary idea behind collaboration in planning is based on an *'argumentative planning process'* (Rittel & Webber, 1973, p.162 as cited in Tang, 2006, p. 13) which encourages discussions among different interests in the community to facilitate the formation of the resolution as a possible output of the discussions (Rinner, 1999, p. 21-22 as cited in Tang, 2006, p. 13). As a result, while many people are involved in the decision-making and formation of the arguments for planning, authorities and implementers stay away from interfering with the problem-solving process (Rinner, 1999, p. 21-22 as cited in Tang, 2006, p. 13). Participants should be the primary decision-makers in the planning from the very early stages (Rittel, 1972, as cited in Rinner, 1999, p. 21-22, as cited in Tang, 2006, p. 13)[11].

The necessity to engage public in the decision-making is becoming inevitable (Schlossberg & Mattia, 2003, p. 3). As interactions between community members get more complicated, the need for getting a comprehensive view on public interests and integration of local and technical knowledge for solving current community issues becoming inescapable by

[11] (*This article is written in Norwegian. An English version is not available. Citation in this thesis comes from Rinner [1999]*): As cited in Tang, 2006

authorities (Innes, 1995; Healey, 1997; Forester, 1989, as cited in Schlossberg & Mattia, 2003, p. 3). The unique characteristic of a participatory planning is giving the authorities the capability to integrate competing interests toward agreeing on a common matter where stakeholders get familiar with other perspectives and look for "*mutual gains"* (Susskind, van der Vansem, & Ciccarelli, 2000, as cited in Schlossberg & Mattia, 2003, p. 3).

The collaborative decision-making process can be implemented in three steps: firstly, determining the problem, then designing the process and its requirements, and finally implementing the decisions (Gray, 1989; Margerum, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). Explicit determination of the issue and recognizing related the stakeholders and impacted people is a critical start to the process (Schlossberg & Mattia, 2003, p. 3). The primary objective in designing the process and selecting the proper methods for decision-making process is facilitating an inclusive and fair process that is helpful for consensus-building (Schlossberg & Mattia, 2003, p. 3). Finally, lengthy discussions on diverse solutions, their restrictions, and compatibility with public's values and preferences, the resulted solutions will be implemented (Schlossberg & Mattia, 2003, p. 3).

(1999) divided collaborative planning into four phases. Firstly, the public should agree on the existence of a problem within their community. Secondly, they have to design the process by deciding on who should participate and what the appropriate techniques for consensus-building are. Through the consensus-building phase, participants define the problem and its related affected or affecting entities. Finally, based on the expected outcomes and set goals, people agree to implement a set of actions (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3).

Online participation

Different methods of participation have been proposed to engage the public in land use planning (Horelli, 2002; Innes & Boher, 2005; Sieber, Robinson, Johnson, & Corbett, 2016, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Open houses are the widespread type of public engagement in planning (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Being open to everyone and providing an opportunity for direct interaction with all the stakeholders and authorities are its advantages

(Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). However, its spatiotemporal restrictions limit the attendance of interested participants (Halvorsen, 2001; Kingston, 2007, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Furthermore, in physical meetings, experiences, knowledge, education, social status, age, ethnicity, culture, gender, and language might limit full contribution in discussions and marginalize specific groups (Halvorsen, 2001; Kingston, 2007; Kahila-Tani, Broberg, Kytta, & Tyger, 2016, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Also, when meetings are held in a specific time and place, it would have limited *"scalability*[12]*,"* which intends to expand geography of the engagement with higher number of participants (Nyerges & Aguirre, 2011, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Spatio-temporal restrictions, therefore, might limit the represented perspectives (Halvorsen, 2001, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2).

Due to differences in education and technical knowledge of the participants, participatory methods and tools should aim at engaging diverse levels of expertise and skills (The Local Government Commission, n. d., as cited in Tang & Waters, 2005, p. 20). The trend in advancing participatory tools also followed the rule to make the tools more interactive and engaging and changing tools from merely informing participants to interactively engaging them through different communication channels (Federal Highway Administration (FHWA), 2003, Tang & Waters, 2005, p. 21). For instance, the Internet provides an interactive engagement tool for participation (Tang & Waters, 2005, p. 22). Internet technology can create a *networked environment* that showcases diverse views and perspectives of community members and enhances virtual communication to facilitate reaching to consensus in decision-making (Lukensmeyer & Hasselblad-Torres, 2006, p. 33).

Internet application for community planning is a unique opportunity for community members to get familiar with other perspectives, priorities, and needs in their community (Lukensmeyer & Hasselblad-Torres, 2006, p. 22). As a result, it is an opportunity for community

[12] *"Capacity of a method to work for various numbers of participants ranging from small to large, and to draw the participants from a range of geographical areas"* (Nyerges and Aguirre, 2011, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojocicki, 2017, p. 2).

members to strengthen their ties to their community (Lukensmeyer & Hasselblad-Torres, 2006, p. 22). By overcoming the physical limitations with the online communication, authorities develop a new virtual connection with the community members (Wellman & Haythornthwaite, 2002; Boase, Horrigan, Wellman, & Rainie, 2006, as cited in Evans-Cowley & Hollander, 2010, p. 398). The internet improves public participation by adding an extra channel of communication to the direct and face-to-face collaboration (Wellman, Haase, Witte, & Hampton, 2001, p. 444).

Adding new types of participation methods to previous collaboration techniques, giving the option to stay anonymous in participation, increasing the number and inclusivity of the participation, providing up-to-date and open information to all, and overcoming the spatiotemporal restrictions, Information and Communication Technologies (ICTs), advanced effectiveness and spread of participatory decision-making (Ammouri, 2002 as cited in Tang, 2006, p. 24). However, degrees of these advancements were different based on the level of interactivity of the provided ICTs (Tang, 2006, p. 25). For instance, Web 1.0 types of websites still were limited to a one-way flow of information from authorities to participants which would limit active participation (Lemos, 2006; Bryant & Wilcox, 2006, as cited in Tang, 2006, p. 25). Only when Web 2.0 was developed to support many-to-many interactions, true collaboration in decision-making became possible (Tang, 2006, p. 26). The transition from controlled and top-down initiated involvement in Web 1.0 to interactive and collaborative content-development in Web 2.0 technologies was the start of the revolutionary era for Web-based participatory decision-making (Tang, 2006, p. 26).

The Internet is widely spread throughout the whole society in an era that its social capital and community relations are very complicated and not limited to geographical boundaries (Haase, Wellman, Witte, & Hampton, 2002, p. 1). However, Social researchers such as Putnam (2000) once proposed that the Internet might be a cause for loosening social and community connections (Putnam, 2000, as cited in Haase, Wellman, Witte, & Hampton, 2002, p. 3). While Putnam (2000) only considered conventional forms of social interactions such as community meetings and charities, people were socially engaged through other new and unconventional communication channels (Haase, Wellman, Witte, & Hampton, 2002, p. 3). Haase, Wellman, Witte, & Hampton (2002) noticed that the weakening social bond that Putnam (2000) recognized as a change in the form and quality of community interactions. At the time, relationships were

changing from "*easily-observed public spaces to less-accessible, private homes."* (Wuthnow, 1991, 1998; Guest & Wierzbicki, 1999; Wellman, 1999, 2001; Fischer, 2001; and Lin, 2001, as cited in Haase, Wellman, Witte, & Hampton, 2002, p. 3). This debate is still very much widespread and has its opponents and supporters (Haase, Wellman, Witte, & Hampton, 2002, p. 4).

Internet is a unique opportunity to gather people with the same interests without being restricted by time, location, cost of communication, outdated information, and gathering place (Sproull & Kiesler, 1991; Baym, 1997; Wellman, 2001, as cited in Haase, Wellman, Witte, & Hampton, 2002, p. 5). Development and progress of the Internet access decreases the digital divide (Katz & Rice, 2002; National Telecommunications and Information Administration (NTIA), 2000; Reddick, 2000; Fong, Wellman, Wilkes, & Kew, 2001 as cited in Haase, Wellman, Witte, & Hampton, 2002, p. 6). However, "*the digital divide is a complex and dynamic phenomenon*" (van Dijk & Hacker, 2003, p.315). Ragnedda and Muschert (2013) suggests measuring the digital divide through investigating the criteria of feasible and accessible Internet, number of accessible websites, level of technical and practical skills of the users, length of staying online and on particular websites, and number and qualities of the other digital activities that is done by people (Ragnedda & Muschert, 2013, p. 1). Now, after the development of the Internet, access is not the main difference between people in using the technology (Ragnedda & Muschert, 2013, p. 2). However, it is the resulted divide between how people access to the information on the Internet. (Dobson & Willinsky, 2009; Eshet and Aviram, 2006; Eshet-Alkali & Chajut, 2009; Hargittai, 2005, 2009; Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006; Livingstone & Helsper, 2010; and Perez-Tornero, 2004, as cited in Ragnedda and Muschert, 2013, p. 2). As a result, unequal proficiency in the digital world deepens the so-called digital divide and then is the new source of social inequalities (Gui & Argentin, 2011, as cited in Ragnedda & Muschert, 2013, p. 2). Tremendous progress in the development of the Internet has decreased the digital divide in physical access to the online world (Ragnedda & Muschert, 2013, p. 2). However, still, people are entirely different in their digital skills (Gui & Argentin, 2011, as cited in Ragnedda & Muschert, 2013, p. 2). The digital divide is a phenomenon that affects web-based participation (Rinner & Bird, 2009, p. 589). As the result, access to the Internet and computer literacy are essential determinants of the quality of the web-based participatory

decision-making (Carver, 2001; Carver & Peckham, 1999; Kingston, Carver, Evans, & Turton, 2000; Peng, 2001, as cited in Rinner & Bird, 2009, p. 589).

Authorities decide about the relevance and suitability of participation techniques based on their intended level of engagement (Tang & Waters, 2005, p. 21). Tang and Waters (2005), developed a table to compare different participation techniques based on their strengths and limitations in flowing information, communication, trustworthiness, and providing an opportunity for interaction of diverse perspectives (Tang & Waters, p. 22). Based on the results, they showed that WPPGIS had the top scores in all the criteria[13] (Tang & Waters, 2005, p. 21).

To investigate web-based participation, researchers need to gain comprehensive knowledge on access, usage and appropriation of the Internet (Rinner & Bird, 2009; Tang & Waters, 2005; Van Dijk, 2003). There are four stages of *"motivation, material access, skills access, and final usage"* for appropriating Internet (making the Internet accessible) as a participation tool (Van Dijk, 2003, p. 315). Challenges and obstacles of each stage are different and should not be considered equal (van Dijk & van Deursen, 2014, 60). With the improved and progressed technology, it seems that the motivation and material access has gained more development while skills access which is measured based on digital knowledge is still in its primitive level (van Dijk & van Deursen, 2014, p. 60). van Dijk and van Deursen (2014) consider the skills access as the primary determinant of the success of the web-based collaborative decision-making projects. It can be concluded that the digital divide in the era of the extensive usage of the Internet can be mainly measured based on the differences in digital skills (Ragnedda & Muschert, 2013, p. 2).

Internet usage as the last stage of van Dijk's (2003) model is dependent on the qualities of the previous three steps. It means people's motivations, material access, and skills access determine their final usage of the Internet (van Dijk, 2003, p. 316). As a result, motivation determinants such as demographic characteristics of age, gender, occupational level, and education are as important as the physical access through the development of necessary software

[13] The table has been extracted from a discussion of urban park and recreation recovery planning program" in http://www2.cr.nps.gov/pad/plancompan/publicpartic. However, the link and the address provided by Tang and Waters (2005) is not accessible anymore.

and hardware (van Dijk & van Deursen, 2014, p. 56). However, the importance of the skills access is not comparable to the other two and extends further to diverse skills from technical, social and intellectual capabilities (van Dijk & van Deursen, 2014, p. 48). Skills access is also influenced by demographic and socio-economic characteristics of the users and might become a source of marginalization, as well (van Dijk & van Deursen, 2014, p. 45).

Based on the categorization of the van Dijk and van Deursen (2014), one of the appropriation skills of the digital media is the content-creation skill (van Dijk & van Deursen, 2014, p. 48). This skill is the result of the Internet evolution from a content disseminator and user to a content developer (Brake, 2014, p. 591, as cited in van Dijk & van Deursen, 2014, p. 82). The content that public can create and share on the Web 2.0 can have diverse characteristics and certainly need different skills including images, videos, maps, voices, and even messages in online forums (van Dijk & van Deursen, 2014, p. 50). Even though content creation still requires several skills such as interactive communication and active creation of relevant topics that are not equal among the public, the widespread of Internet and social media have made the public capable of using their amateur capabilities to produce and share the digital contents and overcome this new inequality in access to digital media (van Dijk & van Deursen, 2014, p. 54). However, van Dijk and van Deursen (2014), believes that the proficiency in the digital content creation skills needs more extensive knowledge and capabilities and can create more significant digital divide than the traditional media skills (van Dijk & van Deursen, 2014, p. 55).

There are several digital skills that need to be acquired and advanced by Internet users to be able to participate in web-based decision-making actively (Jenkins, Putushotma, Weigel, Clinton, & Robinson, 2006, p. 4). Some of those skills are not common among Internet users and need higher levels of knowledge about online interactions (Jenkins, Putushotma, Weigel, Clinton, & Robinson, 2006, p. 4). As a result, Jenkins and his colleagues (2006) argue that the progress in access and general online skills cannot guarantee that the Internet can efficiently enhance participatory decision-making (Jenkins, Putushotma, Weigel, Clinton, & Robinson, 2006, p. 3). Furthermore, there are social and communicative skills specified for the online world that are critical for an active web-based participation including articulating preferences and interests on the internet medium, content creation for online communication, involvement in online decision-making and motivation and capability to enhance new skills such as networking,

navigation through different mediums, comprehension of diverse communication channels, and negotiation for consensus-building in virtual environment (Jenkins, Putushotma, Weigel, Clinton, & Robinson, 2006, p. 5).

There are ample studies that have researched the correlation between demographic characterises and Internet usage (Brenner, 2003; Mancini et al., 2006; Im & Chee, 2008; Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002; Markman, Markman, Belland, & Petersen, 2006; Peterson, & Fretz, 2003, as cited in Hardiker & Grant, 2011). For instance, Hardiker and Grant (2011) investigated the determinants of the public participation in eHealth[14] services (Hardiker & Grant, 2011, p. 9). Based on their study, there are four types of determining factors that impact usage of the eHealth services including *"users, technology, eHealth services and society"* (Hardiker & Grant, 2011, p. 3). Finally, due to the results of the web-based reporting system, they concluded that age had had the most determining impact on the usage of the eHealth services regardless of other determining factors (Hardiker & Grant, 2011, p. 9). In another study, Mancini et al. (2006) investigated the Internet use by French cancerous patients and concluded that there is a negative correlation between age and Internet use in eHealth services (Mancini et al., 2006 as cited in Hardiker & Grant, 2011, p. 3). Another contributing factor that is negatively influencing Internet access is the ethnicity (Hardiker & Grant, 2011, p. 3). Williams, Nicholas, and Huntington (2003) reviewed the application of eHealth information kiosks by female patients and concluded that women were not interested in using the kiosks because of their strong assumption of the complexity of the use and lack of knowledge about the availability of such options for acquiring information for patients (Williams, Nicholas, & Huntington, 2003, as cited in Hardiker & Grant, 2011, p. 4).

Besides the profile of the users, features of an online service are also an essential factor for the usage measurement (Cline & Haynes, 2001, as cited in Hardiker & Grant, 2011, p. 9). In Skinner's (2003) report, one of the most popular features of accessing information on the Internet is the anonymity which helps to manage confidentiality and secrecy (Skinner, Biscope, & Poland, 2003, as cited in Hardiker & Grant, 2011, p. 6). In their research, one of the obvious advantages of online communication over face-to-face meetings was providing control for participants over

[14] *"Healthcare practice that is supported by electronic processes and communication."* (Della Mea, 2001, as cited in eHealth: Wikipedia, 2017).

time and location of their engagement (Skinner, Biscope, & Poland, 2003, as cited in Hardiker & Grant, 2011, p. 6). Beside accessing information and having control on the engagement process, participants reported the feeling of being empowered (Skinner, Biscope, & Poland, 2003, as cited in Hardiker & Grant, 2011, p. 6). However, based on the characteristics of the online service, its objectives, users and target groups, anonymity might impact use negatively (Hardyman, Hardy, Brodie, & Stephens, 2005, as cited in Hardiker & Grant, 2011, p. 6). Hardyman, Hardy, Brodie, and Stephens (2005) exemplified an online cancer information service that anonymity and generalizing website's content affected patients' usage by preferring calling to helpline for their questions rather than access to the website (Hardyman, Hardy, Brodie, & Stephens, 2005, as cited in Hardiker & Grant, 2011, p. 6).

Bruwer and Stein (2005) studied people's perspectives in an online community and found that similar to the real community, participants of the online community develop a strong sense of belonging to the online group (Bruwer & Stein, 2005, as cited in Hardiker & Grant, 2011, p. 5). While the research of Bruwer and Stein was unmediated discussions through an email list, participants considered that the existence of diverse perspectives in the community and personal relations are restricting their active online participation (Bruwer & Stein, 2005, as cited in Hardiker & Grant, 2011). Blackburn and Read (2005) investigated online participation barriers and concluded that recognizing Internet as an unreliable source of information and lack of skills for proper usage of the Internet were perceived to be two equally essential barriers of using internet (Blackburn & Read, 2005, as cited in Hardiker & Grant, 2011, p. 7).

In using eHealth services, there is a negative correlation between aging, and socioeconomic status (Hardiker & Grant, 2011, p. 9). Older people with lower economic conditions tend to perceive eHealth services to be less useful (Hardiker & Grant, 2011, p. 9). Furthermore, people might not be able to efficiently use the Internet due to their ethnicity and insufficient experience with online interactions (Dickerson et al., 2004; Williams, Nicholas, & Huntington, 2003; Skinner, Biscope, & Poland, 2003, as cited in Hardiker & Grant, 2011). Particular ethnicity (whites) had higher knowledge on using the Internet and gender would make the difference even more significant (Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002, as cited in Hardiker & Grant, 2011, p. 9).

Technical proficiency and skills for using Internet appear to be the critical limiting factor for using the eHealth services (Cline & Haynes, 2001, as cited in Hardiker & Grant, 2011, p. 9). Cline and Haynes (2001), also found out that providing good access not necessarily result in an increase the Internet use. In another word, *"access in inequitable."* (Cline & Haynes, 2001, as cited in Hardiker & Grant, 2011, p. 9). Provided information on eHealth services can act as a barrier or motivation for participation (Hardiker & Grant, 2011, p. 9). Determining criteria of motivating content includes the amount of information, its significance, clarity, trustworthiness, neutrality, specificity, and personalizability (Cline & Haynes, 2001, as cited in Hardiker & Grant, 2011, p. 9). While the advantages of using eHealth services are evident, still public's perception of its usage is different (Hardiker & Grant, 2011, p. 10). Beside personal motivations, sociodemographic characteristics such as age, educational level, economy, and ethnicity are the most influential determinants of the degree of public participation in using eHealth services (Hardiker & Grant, 2011, p. 10).

Adding Internet and the online interaction to the participation equilibrium provides new approaches and possibilities for public engagement and extends the communication channels which significantly impact the cost and quality of the participation (di Gennaro & Dutton, 2006, p. 299). Interaction in the online world can be *"horizontal and vertical"* that can provide communication within the public horizontally or with authorities vertically (di Gennaro & Dutton, 2006, p. 299). In another word, Internet diverts a top-down vertical relationship to a more interactive and bottom-up relationship (di Gennaro & Dutton, 2006, p. 299).

Social relations and hierarchies of power are continued to the online world (Gibson, Lusoli, & Ward, 2005, as cited in di Gennaro & Dutton, 2006, p. 300). It is why Internet might become a new source of marginalization because of the inequalities in skills, education, economic status, access and knowledge the part of the public who have had the privilege to engage in the decision-making previously, would still have the option to involve in the online decision-making and the ones who were already excluded from social interactions become more marginalized (Gibson, Lusoli, & Ward, 2005, as cited in di Gennaro & Dutton, 2006, p. 300).

In comparison, Internet users are more active in their social interactions, than non-users (Robinson, Kestnbaum, Neustadtl, & Alvarez, 2000, as cited in Weber, Loumakis, & Bergman,

2003, p. 28). Also, based on sociological research by decreasing the costs of social interactions, the Internet can enhance community relations (Weber, Loumakis, & Bergman, 2003, p. 28). Virtual spaces and online forums are excellent opportunities for the public to share their information on community issues and exchange opinions and concerns (Alexander, 1999, as cited in Weber, Loumakis, & Bergman, 2003, p. 28). In comparison to traditional public meetings, online forums are more effective in involving the public in planning at the local scale (Brants, Huizenga, & Van Meerten, 1996, as cited in Weber, Loumakis, & Bergman, 2003, p. 28). Internal communication and networking in a community can be improved by Internet interactions which is convenient, cheap and accessible for community members (Klein, 1999, as cited in Weber, Loumakis, & Bergman, 2003, p. 28). As the resulting Internet is a solution for spatiotemporal restrictions of the public meetings (Klein, 1999, as cited in Weber, Loumakis, & Bergman, 2003, p. 28). However, authorities and planners should be cautious about the potential adverse effects of the Internet on marginalizing particular groups and misbalancing powers in the community due to the unequal levels of access, technical skills and costs (Klein, 1999, as cited in Weber, Loumakis, & Bergman, 2003, p. 28).

The relation between amount of disseminated information and participation rate are not necessarily correlated positively, and authorities cannot assume if they increase the accuracy and amount of the information, people get more interested in participating in decision-making (Bimber, 2001, as cited in Weber, Loumakis, & Bergman, 2003, p. 28). In the comparison of online and offline participation, Weber, Loumakis, and Bergman (2003) concluded that if active participants of the offline meetings are not limited by their age, education, gender, and ethnicity, they are more likely to be more motivated than non-active offline participants to be involved efficiently in online decision-making, as well (Weber, Loumakis, & Bergman, 2003, p. 37).

GIS

One of the primary objectives of a healthy community is enhancing its well-being (Craig, Harris, & Weiner, 2002, p. xxii). Improving communication tools and sharing information can help community members to increase their knowledge through collective intelligence, mutual learning and online interactions which at the end would make the connection between the community and its members more efficient and healthy (Craig, Harris, & Weiner, 2002, p. xxii).

One of the technologies that can facilitate communication and information sharing is Geographic Information Systems (GIS) which can be applied for planning and conflict resolution in the community (Craig, Harris, & Weiner, 2002, p. xxii). As a result, application of new technologies and tools for participation add new layers to the successful functioning of the community (Craig, Harris, & Weiner, 2002, p. xxii).

GIS as a digital mapping tool requires proper hardware and software to integrate spatial and qualitative data (Kemp, 2008, p. 191). By providing new perspectives on existing issues, predicting and investigating future problems and developing scenarios, GIS can be considered a comprehensive management tool (Kemp, 2008, p. 193).

Initial use of the GIS was limited to oil companies when Prudhoe Bay community on the north slope of Alaska started to use it for the first time for land-use permit discussions in the 1980s (Craig, Harris, & Weiner, 2002, p. xxii).

Due to the location-pinned topics in the planning, GIS has been adopted by planners widely (Tang, 2006, p. 29). GIS was popular in planning because it could easily visualize spatial data. With the development of the Spatial Decision Support System (SDSS), GIS became more popular in adding non-spatial information to its community planning options (Tang, 2006, p. 30). The introduction of SDSS then made GIS a tool that planners could use to promote discussions among stakeholders and enhance their interactions (Rinner & Bird, 2009, p.590). SDSS includes a DSS (decision support system) and GIS (geographic information system) (Spatial decision support system, 2017). By integrating location-based and non-spatial data (e.g., qualitative data) SDSS, transforms GIS to a more comprehensive planning tool that can store, manipulate, and analyze different types of data (Spatial decision support system, 2017). SDSS helps community planners to make better decisions after researching the potential consequences of certain decisions (Spatial decision support system, 2017).

Nyerges et al. (2002) suggested that GIS has unique capabilities for collecting and analyzing local knowledge that makes community planning more effective (Nyerges, Jankowski, & Drew, 2002, as cited in Tripp, 2007, p. 1). Application of GIS by local communities with the

support of experts would be an empowering experience (Wood, 2005, as cited in Tripp, 2007, p. 1).

PPGIS

Public Participation GIS (PPGIS) began in the mid-1990s as *"a GIS-facilitated approach to collecting and transferring public preferences and knowledge into formalized representations used by experts, and thus enabling a dialogue between experts, decision-makers, and the public"* (Craig, Harris, & Weiner, 2002, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 3). The primary focus of the PPGIS in its early practices was providing an opportunity for the involvement of the marginalized and grassroots groups in resource-related discussions (Harris & Weiner, 1998; Sieber, 2006, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). PPGIS further developed and transformed to more advanced and complex qualitative functions such as mapping environmental preferences of people (Brown & Kytta, 2014, as cited in Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). The popularity of the PPGIS is mainly because of the annual conferences of the Urban and Regional Information Systems Association (URISA: http://www.urisa.org/) that has been held since 2002 (Craig, Harris, & Weiner, 2002, as cited in Tang & Waters, 2005, p. 8).

A widely used public meeting among other participatory techniques was restricted in time and location, and it was expensive, as well (Liu, 2007, p. iv). As a result, implementors were looking for approaches and techniques that could have the most advantages and the least disadvantages for influential public participation (Liu, 2007, p. iv). At the time that GIS was used for the planning as a professional tool, the public could only be engaged in commenting about the final plan at the last stage (Aitken & Michel, 1995; Harris & Weiner, 1998; Peng, 2001, as cited in Liu, 2007, p. iv). In such environment, tools such as GIS would further marginalize the non-skilled people (Liu, 2007, p. iv). Introduction of PPGIS then was a unique opportunity to integrate GIS and public participation for deliberative decision-making in community planning (Schlossberg & Shuford, 2005, as cited in Liu, 2007, p. iv).

The practical implication of PPGIS in community planning has not progressed at the same pace as the academia (Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017,

p. 4). As an example, Carver et al. (2001) carried out a case study that investigated the application of a map to enhance community-related discussions (Carver, Evans, Kingston, & Turton, 2001, as cited in Rinner & Bird, 2009, p. 592). The main reason behind the limited use of the PPGIS by authorities was the questions about the validity of the public information (*"crowd-sourced data"*) and the applicability of considering public preferences (Brown, 2015, as cited in Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). Furthermore, initial costs of setting a PPGIS project was high (Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). Authorities and community planners who usually prefer methods that can function properly with the minimum of investment, needed further justification on how financially moreover, technically it is wise to use PPGIS instead of more conventional methods such as public meetings (Ganapati, 2010, as cited in Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). It seems full spread of the PPGIS can be expected when PPGIS developers consider authorities' concerns in their design and adoption strategies (Czepkiewicz & Snabb, 2013, as cited in Jankowski Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4).

Previous research was trying to investigate how promote the further application of GIS by society and how technology enhancement can improve technical difficulty of public use of GIS? (Schroeder, 1997, as cited in Sadagopan, 2000, p. 2).

While the central philosophy behind PPGIS development was public involvement in decision-making, but similar to GIS, it can be a reason for marginalizing particular groups (Kyem, 2004; Harris, Weiner, Warner, & Levin, 1995; Abbot et al., 1998, as cited in Tripp, 2007, p. 1). Comprehensibility of the presented data to the public, for example, can either encourage facilitate taking informed decisions or disempower some groups due to its complexity (Tripp, 2007, p. 1). In two research by Obermeyer (1998) and Ghose (2003), they researched the public opinion in regard of using PPGIS for community mapping initiatives (Obermeyer, 1998; Ghose, 2003, as cited in Tripp, 2007, p. 1). The public strongly felt empowered by being provided an opportunity to articulate their concerns in community planning and thought that the PPGIS could facilitate fair access to accurate and up-to-date information by participants (Obermeyer, 1998; Ghose, 2003, as cited in Tripp, 2007, p. 1). The PPGIS is an excellent

opportunity to integrate local and technical knowledge in community planning (Tripp, 2007, p. 1).

"Joint fact-finding" is an approach to facilitate reaching an agreement on the context and scale of an existing issue in a community (Schlossberg & Mattia, 2003, p. 10). During participatory decision-making circulating information through discussions and joint fact-finding processes shared knowledge becomes *"intellectual capital"* (Innes, 1998, as cited in Schlossberg & Mattia, 2003, p. 11). As more people get involved in socially construct intellectual capital, it is possible to reach a consensus in decision-making (Schlossberg & Mattia, 2003, p. 11). GIS facilitates the process of *"joint fact-finding"* and consequently enhancing intellectual capital (Schlossberg & Mattia, 2003, p. 11). By focusing the attention of the participants on particular issues, GIS can create meaningful discussions in the consensus-building procedure (Schlossberg & Mattia, 2003, p. 11). Visualization capabilities of GIS help participants to comprehend complex community issues easier (Schlossberg & Mattia, 2003, p. 11). It is also beneficial when the location-related issues of the community are analyzed and discussed with GIS which facilitates sharing knowledge and making informed decisions (Schlossberg & Mattia, 2003, p. 11).

While GIS mostly is a technical tool that targets technicians and planners, PPGIS is an attempt to bring the qualities of the technical GIS to communities (Schlossberg & Shuford, 2005, p. 15). As the result adoption of the PPGIS in community planning requires a clear definition of the potentials, expectations, and limits of the PPGIS in participatory decision-making (Schlossberg & Shuford, 2005, p. 15).

PPGIS as a concept first was contextualized in the meeting of *'GIS and Society: the social implications of how people, space, and environment are represented in GIS'* at the NCGIA in 1996 (NCGIA, 1996a, 1996b, as cited in Sieber, 2006, p. 492). PPGIS primarily was known as GIS/2 (Sieber, 2006, p. 492). GIS/2 is a combination of methods, tools, and processes that aims to represent a community's diverse interests and perspectives (Schroeder, 1996a). GIS/2 was an attempt to engage public in information creation actively and perspectives integration to contextualize a new and agreed determination of the existing issues in the community (Schroeder, 1996a).

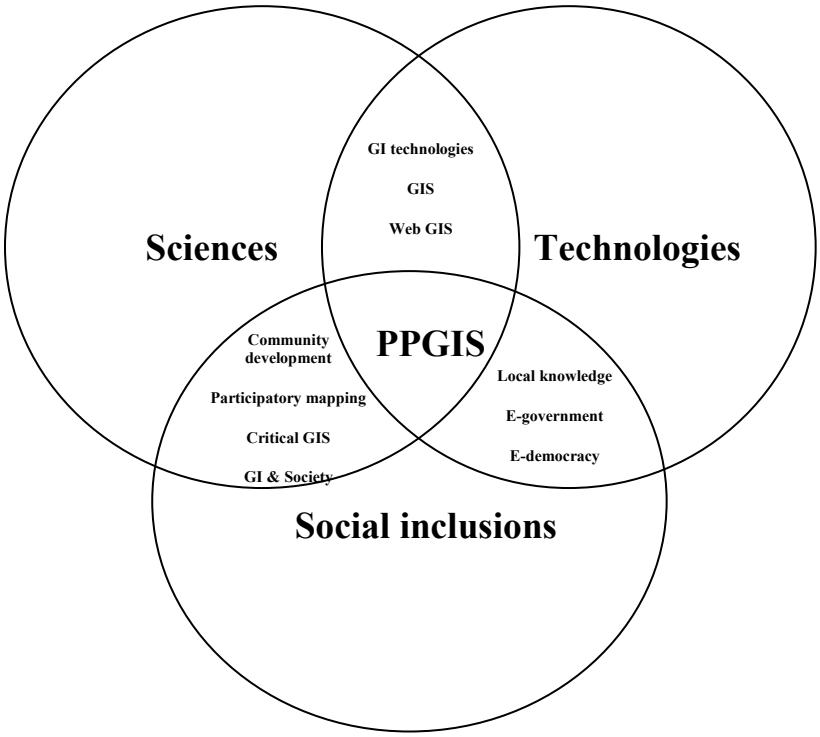
First applications of PPGIS (GIS/2) were on consulting localities for clam fisheries and a national communication network (Schroeder, 1996a). PPGIS provided comprehensive information from local perspectives, preferences, interests, and conflicts on both cases which were more fruitful than the one-dimensional analysis of spatial information in GIS application (Schroeder, 1996a). It can be concluded that GIS/2 was a redefinition of collecting data and analyzing output in the decision-making (Schroeder, 1996a). The public openly provided input for the project and authorities share the decision over the output with the public, as well (Schroeder, 1996a). Schmitt and Brassels published the paper *"From GIS for control to GIS for creative exploration"* in the conference of Initiative 19 (I-19) in 1996 were the turning point in the progress of GIS/2 (Schmitt & Brassel, 1996, as cited in Schroeder, 1996a). In their paper, they predicted that new applications of GIS in future would provide further space for personal experiences and involve people as source and creators of the information (Schmitt & Brassel, 1996, p. 166, as cited in Schroeder, 1996a). The different debate on the validity of local information and whether they can be used for actual planning is still ongoing (Weiner, Harris, & Craig, 2002, p. 4). For example, Openshaw (1991) believed previous experience with GIS impact the quality of information in GIS and Goodchild (1991) noticed that people with local spatial knowledge can be an excellent assistance when GIS cannot provide the necessary answer (Openshaw, 1991; Goodchild, 1991, as cited in Weiner, Harris, & Craig, 2002, p. 7).

The I-19 later initiated the PPGIS Workshop that was held at the National Center for Geographic Information and Analysis (NCGIA), at Orono, Maine (1996) (Schroeder, 1996b). The Public Participation GIS Workshop reviewed the main restriction of integrating technical and social information in GIS (Schroeder, 1996b). The primary goal of the Workshop was involvement of the public in spatial analysis of local information (Schroeder, 1996b). It was assumed that if GIS can be placed as a base for encouraging discussions among localities about existing issues in their community, it can be an opportunity to redefine local problems and look for creative solutions (Schroeder, 1996b). Orono's Workshop also changed the term GIS/2 to PPGIS which is a better representation of its function and objectives (Schroeder, 1996b). However, GIS/2 was not disappeared entirely, and these two terms are used for referring to different concepts (Schroeder, 1996b). While GIS/2 was mainly a reference to prospect technical

progress in the field of GIS and society, PPGIS focused on the GIS and society interactions to enrich decision-making (Schroeder, 1996b).

Science, technology, and society are leading contributors in the development of PPGIS and cannot be separated mainly because technology and science are advanced through social interactions (Schuurman, 2000, as cited in Turkucu, 2008, p. 22). Turkucu (2008) demonstrated the relationship between these three components and their synergic and singular influence in framing PPGIS (Diagram 1).

Diagram 1 Intersections between three entities of technology, sciences, and social inclusion (Turkucu, 2008, p. 23)



Schlossberg and Shuford (2005) reviewed several PPGIS projects of the time and concluded that they have not been successful in contextualizing PPGIS mainly because they lack a precise determination of their participants and type of participation in their study context (Schlossberg & Shuford, p. 16). However, previously Onsrud and Craglia (2003), argued that naturally reaching a precise definition of public participation is challenging: *"Public participation is not a unique and shared construct. It is a complicated process with multiple*

meanings that lead to numerous expectations." (Craglia & Onsrud, 2003, p. 13, as cited in Schlossberg & Shuford, 2005, p. 16).

PPGIS can be applied for diverse topics (Jankowski & Nyerges, 2003; Tulloch, 2003; Craig, Harris, & Weiner, 2002, as cited in Schlossberg & Shuford, 2005, p. 16). However, the many different application of the PPGIS is similar in their attempt to involve public in spatial decision-making (Al-Kodmany, 2001, as cited in Schlossberg & Shuford, 2005, p. 16). Visual representation of local spatial issues helps community members to agree on the existence of a problem in their community and such agreement, and strengthened trust makes reaching to consensus and potential resolution possible (Schlossberg & Shuford, 2005, p. 16).

In the process of evolving the relationship between GIS and society at NCGIA[15] meetings (NCGIA, 1996, as cited in Sieber, 2006, p. 492), GISoc was introduced as a new concept within the field of GIS/2 (Sieber, 2006, p. 492). GIS and Society (GISoc) are interested in studying the influence of GIS in society and why it can have such impact (Sieber, 2006, p. 492). Whereas PPGIS is different in definition, function, and ontology from GISoc (Sieber, 2006, p. 492). Sheppard (1995) contextualized the difference between GISoc and PPGIS as the differences between the theoretical and practical study of the relationship between GIS and society (Sheppard, 1995, p. 15, as cited in Schlossberg & Shuford, 2005, p. 492). As a result, PPGIS is the practical application of GIS in the society and facilitation of community's participation in decision-making (Schroeder, 1996a, as cited in Schlossberg & Shuford, 2005, p. 492).

Participatory GIS (PGIS) and PPGIS are sometimes used interchangeably, but in practice, PGIS[16] is mostly used for more primitive application of GIS for participation in development and PPGIS is more of advanced application of GIS for public participatory community planning and interests' visualization (Sieber, 2006, p. 493).

[15] National Center for Geographic Information and Analysis
[16] PPGIS should be distinguished from PGIS with clear definition of their applications and functions (Brown, 2012, p. 7).

PPGIS is ontologically a division of Geographic Information Science (GISci)[17] which is the discipline of investigating efficient spatial decision-making systems (Kemp, 2008, p. 188). With the support of GISci knowledge, still, PPGIS has limitations in the application, usage, access, and technical specificity (Kemp, 2008, p. 351). While the application of GIS for community planning is a standard tool for authorities, PPGIS application by local communities has not been developed equally (Kemp, 2008, p. 351). The diversity of the application of PPGIS makes its definition challenging (Kemp, 2008, p. 351). In an attempt to find similar features of some of the practiced PPGIS for formulating a general definition of PPGIS around its facts, Kemp, investigated diverse projects from government-initiated community planning in Minneapolis (Leitner, 2002, as cited in Kemp, 2008, p. 351); Incorporation of technical and local knowledge in land reform in Africa (Harris & Weiner, 2002, as cited in Kemp, 2008, p. 351); Growth map by farmers in Wisconsin (Jensen & Field, 2005, as cited in Kemp, 2008, p. 351); and Natural resources database in Ghana for forestry (Kyem, 1998, as cited in Kemp, 2008, p. 351). Kemp (2008) concluded that these diverse projects are similar in their requirement for participating impacted communities in decision-making which is necessary for a productive and successful project (Kemp, 2008, p. 351).

Beside having diverse applications, another obstacle facing defining PPGIS is the different terms that are used to refer to the same concept by different people in this field (Tulloch, 2008, as cited in Brown & Kytta, 2014, p. 124). PPGIS attracts diverse professions, and expertise and such different backgrounds make reaching to a common language difficult (Tulloch, 2008, as cited in Brown & Kytta, 2014).

Ideally, researchers try to define PPGIS as a participatory phenomenon deliberately. However, including all the diverse and different opinions and perspectives on what is PPGIS, makes it too inclusive. Almost every activity that uses GIS and public opinion in its procedure can be defined as a PPGIS project (Brabham, 2009, p. 255; Ramasubramanian, 2011, p. 408). In a widely accepted definition of PPGIS, it has been defined as *"a study of the uses and applications of geospatial information and/or geospatial technology employed by members of the*

[17] *"Geographic Information Science addresses the fundamental issues underlying geographic information systems (GIS) and their use to advance scientific understanding."* (Kemp, 2008, p. 188).

public for participation in the public processes affecting their lives." (Tulloch, 2003, as cited in Zhao, 2007, p. 23).

New trends in applying PPGIS has distanced from using it for decision-making to more of social responsibility and volunteerism (Stirling, 2008, as cited in Wickson, Delgado, & Kjolberg, 2010, p. 757). For instance, Green Mapping is an initiative that is lead and maintained by community members to develop a map database of eco-resources in their community (Green Map, 2018). However, currently there is no plan from the authorities or planners to use those maps for future development, and the motivation behind citizens' participation is more of volunteer engagement without any specific desired outcomes in mind (Wickson, Delgado, & Kjolberg, 2010, p. 758).

PPGIS projects can be different in their context and delivery method. Also, level of complexity and technical knowledge can differ for different projects. PPGIS has been traditionally practiced through traditional participatory methods, and the new trends have taken PPGIS service the World Wide Web (WWW). Appropriateness of the access location and delivery method depends on the sufficiency of the knowledge and skills of the participants and whether each target group's demographic characteristics suits the selected method (Liu, 2007, p. 59). Furthermore, level of technical support that people receive while applying PPGIS might limit their independent experiment with the technology (Liu, 2007, p. 59). Such dependency might later be criticized as a controlling tool enforced by authorities to dictate their preferred planning scenarios (Liu, 2007, p. 59).

Now a day, Internet acts as a convenient and accessible delivery tool for PPGIS in communities. However, due to the limited access and skill level of the community members, it might be a source of marginalization as well (Gibson, Lusoli, & Ward, 2005, as cited in di Gennaro & Dutton, 2006, p. 300). Some of PPGIS initiators have attempted to overcome obstacles caused by the necessity of having some basic technical knowledge for online participation and the threat of being dependent and influenced by authorities' biased information (Leitner, 2002, as cited in Liu, 2007, p. 58).

PPGIS can influence many aspects of the community members' lives directly by involving public in making decisions about their community and indirectly by enhancing deliberative discussions and consensus-building in the neighborhood. Besides all the potential positive impact of the PPGIS, people might get impacted negatively by misrepresentation of their opinions, marginalization due to low technical skills, and misunderstanding of priorities and interests by PPGIS application. Such weaknesses might cause the authorities to promote their own desired scenario.

WPPGIS

Adding an Online connection to PPGIS provides new possibilities for participatory decision-making (Pocewicz, Nielsen-Pincus, Brown, & Schnitzer, 2012, p. 40). For instance, web-based participation can provide more efficient interactions, improve accuracy of the information by ongoing updating, reduce costs related to data collection, physical meetings, and transcribing, and can direct decision-makers to reach to consensus in shorter time (Couper & Miller, 2008; Brown & Reed, 2009, as cited in Pocewicz, Nielsen-Pincus, Brown, & Schnitzer, 2012, p. 40). There are also disadvantages to web-based participation due to limiting participation to specific groups, influencing the quality of participation, and interfere with neutral data collection (Olsen, 2009, as cited in Pocewicz, Nielsen-Pincus, Brown, & Schnitzer, 2012, p. 40). To investigate such disadvantages, for instance, Manfreda (2008) compared online and offline survey and concluded that the web-based survey limits the participation of specific groups and decreases the response rate (Manfreda, Bosnjak, Berzelak, Haas, & Vehovar, 2008, as cited in Brown & Kytta, 2014, p. 133 and Pocewicz, Nielsen-Pincus, Brown, & Schnitzer, 2012, p. 40).

While there is no standard guideline specifying the implementation procedure of the WPPGIS, implementers craft their WPPGIS (Turkucu, 2008, p. 27). However, it sounds natural to integrate online and offline participation rules to implement a WPPGIS.

PPGIS is an attempt to bring technology to the community to be used by the general public (Carver & Peckham, 1999; Craig, 1998, as cited in Rinner & Bird, 2009, p. 589). WPPGIS goes a step further by providing access to web-based participation for community members which was traditionally used by elites (either having higher socio-demographic status

or higher technical expertise) (Turkucu, 2008, p. 27). Nowadays, more planning companies get interested in applying Web-based GIS in their participatory decision-making (Plewe, 1997, as cited in Turkucu, 2008, p. 27). Planners find Internet an effective medium that can be used as a new tool for participatory planning (Turkucu, 2008, p. 27). There are several other advantages for applying WPPGIS in community planning from a planner's point of view including: holding meetings that are not restricted based on time or location of the participation, empowering marginalized groups, increasing the number of the participants and possibly better representation of the diverse population, easy and accurate online mapping, uniting different data formats, enhancing the compatibility of the system with different types of data, and presenting and visualizing data to community members in a comprehensible and easy-to-understand way (Carver, 2001; Dragicevic & Balram, 2004; Kingston, Carver, Evans, & Turton, 2000; Peng, 2001, as cited in Rinner & Bird, 2009, p. 589).

PPGIS projects would have a commenting system (Evans, Kingston, Carver, & Turton, 1999; Ventura, 2002, as cited in Tang, 2006, p. 3). However, structuring the ideas and following leading discussions is not possible in PPGIS comment boards (Tang, 2006, p. 3). As a result, transforming PPGIS to WPPGIS by providing an accessible chat room or discussion forum might resolve this issue and enhance overall participation (Tang, 2006, p. 3).

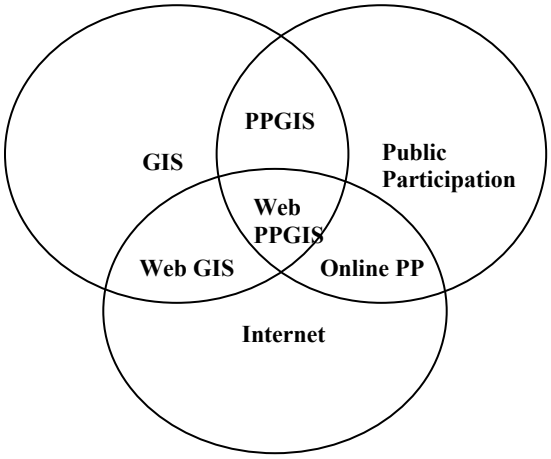
By making GIS accessible online as well as offline in the community planning, more people would have the opportunity to use technology to contextualize their interests in decision-making (Turkucu, 2008, p. 27). Due to the characteristics of the WWW, Kingston, Carver, Evans, and Turton, (1999) noticed that the integration of GIS and Internet would increase the extent of the geographical area of the participation and increase the number of the participants in the decision-making (Kingston, Carver, Evans, & Turton, 1999; Bosworth, Donovan, & Couey, 2002, as cited in Turkucu, 2008, p. 27).

Liu (2007) designed a WPPGIS for collaborative decision-making about the siting of a nuclear waste facility in Ontario supported by the reports of the Nuclear Waste Management Organization (NWMO). The primary focus of the website was enhancing communication (Liu, 2007, p. v). As a result, He designed the website considering the criteria of quality virtual space that could provide an opportunity for data visualization, map-initiated discussions, updated

information, participatory data interpretation and reaching consensus in online discussions (Liu, 2007, p. v).

When GIS, public participation, and Internet are integrated, there is a new opportunity and creative approaches for participatory decision-making (Diagram 2) (Tang & Waters, 2005, p. 24). Each pillar of this combination has its function and support new capacities when integrated (Tang & Waters, 2005, p. 24). WPPGIS, as a result, is an interactive platform for decision-making that combines the advantages of online world such as fast-pasted communication, direct, unbiased, fair, equal, and cheap interactions in a wide geographical area, with GIS capacity to visualize and simplify complicated information for communication, and providing an accurate analyse to actively involve various stakeholders in decision-making (Plewe, 1997; Peng, 1999, as cited in Tang & Waters, 2005, p. 24).

Diagram 2 GIS, public participation, and their integration (Tang & Waters, 2005, p. 24)



Adding web-based GIS to the decision-making supplements the shortages that might be inevitable in offline participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16). For instance, offline participatory decision-making mostly is criticized for being inadequate in their geographic extent of participation or for its limited and non-inclusive participation to physical restriction (Nyerges, 2005; Nyerges & Aguirre, 2011, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Besides increasing the participation by extending the physical restrictions, online participation can open new opportunities regarding time and intensity of participation, as well (Halvorsen, 2001, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Brown

(2015) calls this widespread inclusion in decision-making: *"Crowd wisdom"* (Brabham, 2009; Brown, 2015; Surowiecki, 2004, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). The visualization capacity of the GIS facilitates communication significantly (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). As a result, Kingston (2007) believes the online application of visualizing features such as maps and tables increases the effectiveness of communication and consequently facilitates discussions and reaching to consensus (Kingston, 2007, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Web-based GIS is an opportunity for participants to change their roles as information users to data developers that have the capacity to engage in analysing and interpreting spatial data (Brown, 2015; Rantanen & Kahila, 2009, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). Furthermore, when discussions are conducted and facilitated in the virtual space, the quality of deliberative discussions increases (Rinner, 2001, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2). By increasing public's capacity in comprehending spatial information, facilitating deliberative discussions and extending participation opportunities online, authorities can expect higher quality participation, as well (Nyerges & Aguirre, 2011, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 3).

Based on Kingston's (2002) classification of EParticipation Ladder, WPPGIS is an advanced online participation that combines online discussions (participation), web survey, and DSS (decision support system) with visualization technologies such as GIS to enhance public participation in decision-making (Kingston, 2002a, as cited in Tang & Waters, 2005, p. 20). The provided advantages of Web-based participation in comparison to traditional participation is extensive, even though the combination of both offline and online participation makes the process more effective (Tang & Waters, 2005, p. 25). For instance, one of the highly referenced disadvantages of the offline participation is its spatiotemporal limitation, while the web-based participation overcomes this obstacle by providing a '24/7' access possibility (Kingston, 2002b, as cited in Tang & Waters, 2005, p. 25).

WebGIS (*"Internet GIS," "Online GIS,"* or *"Internet mapping"*) was the original version of the WPPGIS which lacked the interactive features such as the online discussion forum, while still, people could practice online mapping individually (Kemp, 2008, p. 511). With

bringing GIS to the World Wide Web, many planning projects benefitted from its online accessibility and deliverability in the late 1990s (Kemp, 2008, p. 511). Later by adding public participation to the WebGIS, planners could benefit further by involving public in the whole decision-making and consensus-building rather than limiting their source of information to the few online users who were interested at online mapping (Kemp, 2008, p. 511).

Slaithwaite village was one of the first examples of applying WPPGIS in the UK, at 1998 (Turkucu, 2008, p. 28). The technical support of the project was provided by the Center for Computational Geography at the Leeds University (Turkucu, 2008, p. 28). The primary intention of the project was providing an opportunity for villagers to express their opinions regarding the development of the village (Turkucu, 2008, p. 28). Several public computers were provided for the public to use and overcome the access barrier for participation (Kingston, Carver, Evans, & Turton, 1999; Kingston, 2002, as cited in Turkucu, 2008, p. 28). The public input was used as a source for creating a database for community's future developments (Turkucu, 2008, p. 28).

To avoid ineffectiveness participation in projects, Liu (2007) listed the main reasons behind such obstacles including unsuccessful implementation of meaningful involvement in decision-making, putting more weight on scientific and technical knowledge than local insights, unfamiliarity with local preferences and limitations, and ineffective participation tools and technologies (Liu, 2007, p. 3). While the primary objectives of the available public participation techniques are democratic deliberations, it seems that the current situation is far different from the expected result (Liu, 2007, p. 4).

Carver (2001) as one of the first applicants of map commenting on a PPGIS project, used GeoTools Java to collect users' input on the map (Carver, 2001, as cited in Rinner & Bird, 2009, p. 590). Dito was used by Voss et al. (2004) to combine online discussions with an interactive map in CommonGIS (Voss et al., as cited in Rinner & Bird, 2009, p. 591). Rinner (2001), integrated GeoTools Lite and an online discussion forum to structure an interactive map (Rinner, 2001, as cited in Rinner & Bird, 2009, p. 591). The main goal of the Rinner's (2001) prototype was an investigation of the applicability and usability of the interactive map (Rinner, 2001, as cited in Rinner & Bird, 2009, p. 591). GeoDF (Tang, 2006, as cited in Rinner & Bird, 2009, p. 591) and MapChat (Leahy, Hall, Findlay, Nicholls, & Feick, 2006 as cited in Rinner & Bird,

2009, p. 591) were other examples of the online interactive maps that provided the opportunity and facilities for discussing on the community planning issues with online maps (Rinner & Bird, 2009, p. 591).

By combining GIS with the Internet, besides increasing the number of the users, planners can improve the quality of the public engagement in their planning practices (Chang, 1997, Sadagopan, 2000; and Kingston, 2002b, as cited in Tang & Waters, 2005, p. 9). WebGIS is a solution to translate complicated planning information into more understandable information for non-experts (Sadagopan, 2000, as cited in Tang & Waters, 2005, p. 9). There are several instances that WebGIS has been used to integrate different types of information such as maps, pictures, text, and even voice to communicate complex planning issues with ordinary citizens (Tang & Waters, 2005, p. 9).

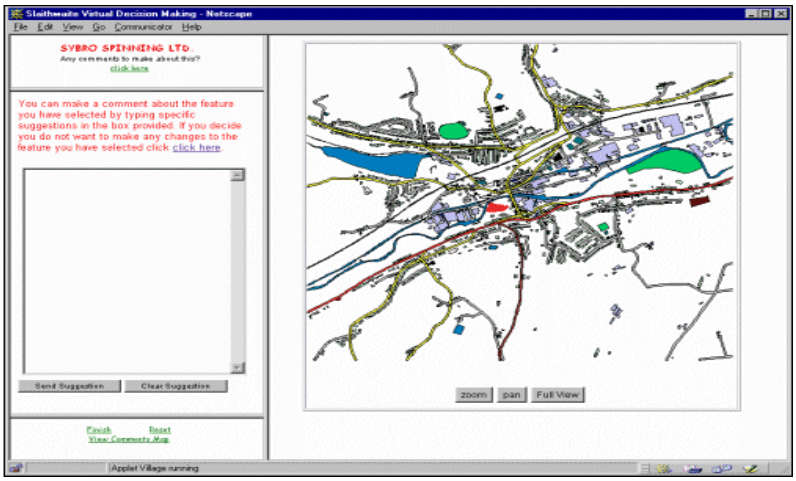
While participation advocates hoped that the advantages of online participation could be used to promote public participation widely, still younger and technology-experienced groups of the community are more interested in participating in online decision-makings (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19). Furthermore, similar to the traditional participation, socio-demographic characteristics of the participants such as education impact the participation in online decision-making, as well (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19). Research on the relation between trust to authorities and type of participation shows no difference between traditional and online participation and level of the trust (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19). However, the level of trust in traditional participatory methods and public meetings tend to be higher than online participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19).

In a case study, Rinner and Bird (2009) conducted an ArguMap in Queen West Triangle in Toronto to evaluate participation interest (Rinner & Bird, 2009, p. 588). The response rate was low, and they concluded that there are interests among the public about WPPGIS application or they might want to know further about the topic of the discussion. However, they may not want to participate themselves (Rinner & Bird, 2009, p. 589).

The result of analyzing the discussions and users' profile on the ArguMap showed that the citizens who participated in discussions had significant knowledge about their community's issues (Rinner & Bird, 2009, p. 598).

Definition of accessibility in good public participation should be extended beyond merely using a computer or having an Internet connection (Rinner & Bird, 2009, p. 598). Ramasubramanian (2000) calls this extended definition as a *"Critical worldview"* (Rinner & Bird, 2009, p. 598). Providing full access to participants becomes meaningful when participants gain the capability of applying this accessibility to express their opinions through content creation and involvement in discussions (Rinner & Bird, 2009, p. 598). ArguMap as a WPPGIS application is an opportunity for ordinary citizens with the low technical expertise to engage in their community's planning (Rinner & Bird, 2009, p. 599). It decreases the restrictions on time and location of the participants and therefore, it is expected to increase the number of the participants (Rinner & Bird, 2009, p. 599). ArguMap also had two different aspects for the users. The discussion forum and the GIS mapping part (Rinner & Bird, 2009, p. 599). The interviews and surveys showed that people conveniently could use the discussion board, but they had difficulty comprehending the function of the online mapping (Rinner & Bird, 2009, p. 599). As a result, it is suggested investigating the operability of the ArguMap by different users (Rinner & Bird, 2009, p. 599).

Figure 1 Virtual Slaithwaite (Kingston, 2002, as cited in Craig, Harris, & Weiner, 2002, p. 105)



SOURCE: www.ccg.leeds.ac.uk/slaithwaite/

Slaithwaite WPPGIS benefitted from online discussion forum by providing a fair opportunity for minorities to express their interests and opinions of the development (Carver, Evans, Kingston, & Turton, 1999). Minority inclusion limits the possibility of representing the idea that only belongs to the dominant vocal community members (Carver, Evans, Kingston, & Turton, 1999). Spatio-temporal restrictions of the public meetings limit the number of participating stakeholders (Carver, Evans, Kingston, & Turton, 1999). As a result, Slaithwaite community used the flexibility of the online participation to involve actively in the development planning in their community (Carver, Evans, Kingston, & Turton, 1999). Such flexibility was beneficial for the participation implementors, as well (Carver, Evans, Kingston, & Turton, 1999).

While WPPGIS in Slaithwaite was considered a successful practice, still there were critics on the appropriateness or necessity of using WPPGIS in small-scale planning (Carver, Evans, Kingston, & Turton, 1999). However, in a typical WPPGIS, it is recommended to integrate online and offline participation to increase the quality of public participation in decision-making (Carver, Evans, Kingston, & Turton, 1999; Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16).

Like any other approach, there are disadvantages in the application of WPPGIS, as well (Carver, Evans, Kingston, & Turton, 1999). Map comprehension is one of the more criticized weaknesses of the WPPGIS which argues that people not be similar in their capability to understand maps[18] (Carver, Evans, Kingston, & Turton, 1999). Furthermore, 3D viewing and aerial perspective is not a natural angle for many people to orient themselves (Carver, Evans, Kingston, & Turton, 1999). Providing an inclusive and accessible online participation in WPPGIS is more challenging than an inclusive traditional participation, because technological skills of the stakeholders (Mossberger, Tolbert, & Stansbury, 2003, as cited in Ramasubramanian, 2008, p. 24) and access limitations (Norris, 2001, as cited in Ramasubramanian, 2008, p. 24) are not controllable for participation implementors (Brabham, 2009; Czepkiewicz, Jankowski, & Mlodkowski, 2016, as cited in Jankowski, Czepkiewicz,

[18] There are various terms to refer to differences in map-comprehension, but most of the resources are not approachable. For instance, in Stack Exchange's website, for question of looking synonyms for map illiteracy or geographic illiteracy, people suggest terms such as *"Ingraphicacy"* (Balchin & Coleman, 1966, as cited in English Language & Usage, 2013) and *"Immapancy"* (The Economist, 2010). However, neither of the sources were actually referring to these terms, nor there is any relevant definition of the terms.

Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 3). Lack of skill and experience in online mapping, cynical assumption of the users on the quality and effectiveness of online participation, and confused over the accuracy of the provided and collected data among users and planners are the other limitations for the expansion of WPPGIS (Kingston, 2007; Brown, 2015, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 3).

Evaluation

It is crucial to determine whether the public participation has met its pre-set success criteria and whether the applied techniques and methods for engaging the public have been effectual. As a result, evaluation is a necessary step in any participatory project (Rowe & Frewer, 2000, p. 3). Lack of a standard procedure for participatory decision-making is a challenge for planners and participatory initiators because their choice of method might cause success or failure of the project based on their skills, technical support, the design of the project or how it has been implemented (Rowe & Frewer, 2000, p. 11).

Evaluation is a formal process to acquire knowledge about the success of a project. It would help to know whether the project has met the pre-set goals and objectives and in case of failure what are the reasons behind that (Aichholzer & Westholm, 2009, p. 16). *"Collective intelligence"* (Brabham, 2009, p. 247) or *"crowd wisdom"* (Brabham, 2009; Brown, 2015; Surowiecki, 2004, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 2) and collecting people's opinion about a participatory project through an evaluation helps practitioners to clarify the weaknesses for the success of the projects and identify the places that need improvement (Aichholzer & Westholm, 2009, p. 16). Such interaction between initiators and the public is an opportunity for *"mutual learning*" (Ambrose, 2013, p. 26; Aichholzer & Westholm, 2009, p. 16). The produced knowledge through the evaluation can be applied as a guide for future public participation practices (Aichholzer & Westholm, 2009, p. 16). Evaluation and assessment might be assumed similar, but they are different. While assessment is mainly based on collecting feedback during a process, evaluation is comparing the results with standards or *"pre-set criteria"* (Westholm & Aichholzer, 2009, p. 16).

There is no widely accepted evaluation method or standard (Crosby, Kelly, & Schaefer, 1986, as cited in Rowe & Frewer, 2000, p. 11). As a result, evaluators should decide about the methods based on their particular situation (Rowe & Frewer, 2000, p. 11). Developing methods and standards for each participatory project for people with different expertise and experience is the big challenge (Rowe & Frewer, 2000, p. 11).

Participation evaluation

There are several recommendations on implementing a more effective public participation (e.g., Crosby, Kelly, & Schaefer, 1986; Fiorino, 1990; Lynn & Busenberg, 1995; Webler, 1995; Smith, Nell & Prystupa, 1997, as cited in Rowe & Frewer, 2000, p. 10). However, the focus is mostly on theoretical considerations of effective participation rather than practical implication procedure (Middendorf & Busch, 1997, as cited in Rowe & Frewer, 2000, p. 10). Some researchers consider these recommendations as evaluation criteria of the quality of public participation (Rowe & Frewer, 2000, p. 10).

However, lack of a standard benchmark that can be used to compare the effectiveness of each participatory tool or method makes validation of those evaluation criteria challenging (Lowndes et al., 1998 as cited in Rowe & Frewer, 2000, p. 4). Besides that, participatory methods and tools are not standardized, as well (Rowe & Frewer, 2000, p. 10). There are rarely manuals on the process of implementing effective public participation (Fiorino, 1990; Webler, 1995, as cited in Rowe & Frewer, 2000, p. 4). As the result implementation and evaluation of effective public participation are limited to isolated case studies which might apply to that specific situation (Rowe & Frewer, 2000, p. 7). Lack of examined cases of implementing effective participation and evaluating benchmark cause insufficient research on the applicability and usability of each method and related criteria (Rowe & Frewer, 2000, p. 7).

Higher quality in the implementation of the participatory process would result to better decisions (Fischer, 2000; Beierle, 2002; Reed, Dougill, & Baker, 2008, as cited in Reed, 2008, p. 2418). Unfortunately, most of the public participation initiators emphasis on the tools and techniques of the participation rather than considering the requirements of a high-quality process (Reed, 2008, p. 2426). In practice, evaluation of the participation outcomes requires further investigation of data collection methods and lengthy evaluation of effectiveness criteria (Reed,

2008, p. 2421). As a result, most of the researchers prefer to focus on evaluating the process of the participation rather than its outcome (Middendorf & Busch, 1997, as cited in Rowe & Frewer, 2000, p. 10; Beierle, 2002; Renn, Webler, & Wiedemann, 1995; Rowe & Frewer, 2000, as cited in Reed, 2008, p. 2421).

WPPGIS is primarily mixing different type of knowledge that is acquired from a variety of sources with different accuracy and validity of their own (Reed, 2008, p. 2425). Integration of this different knowledge is the big concern for WPPGIS projects (Reed, 2008, p. 2425). In theory, WPPGIS considers all the knowledge and opinions valid for the sake of promoting participation (Abbot & Guijt, 1997, as cited in Reed, 2008, p. 2426). Reed (2008) evaluated the accuracy of the indicators of land degradation that local communities and pastoralists used. Surprisingly, the local knowledge and scientific literature were similar in most of the criteria. However, he noticed that several of the scientific criteria were not practically applicable by non-specialists. Also, there was not enough evidence to prove the reliability of the many of the localities' criteria (Reed, 2008, p. 2426). Traditionally, information and knowledge transfer between authorities and public through a one-way flow. However, in newer trends of community planning, planners attempt to shift this one-way *"knowledge transfer"* to a more interactive and two-way communication (Reed, 2008, p. 2426). Such *"joint knowledge production"* is the optimum status for participatory decision-making projects (Phillipson & Liddon, 2007, as cited in Reed, 2008), p. 2426.

To evaluate the process of participation, Schlossberg and Mattia (2003) used Straus' four phases of collaboration process that claimed to make participation successful (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). These four phases then were used to develop the criteria of a successful participatory process (Schlossberg & Mattia, 2003, p. 4) (Table 5).

Table 5 Process-based evaluation criteria (Schlossberg & Mattia, 2003, p. 4)

Process phase	Evaluation category	Authors	Key points
Process design phase	Representative of interests	Susskind & Cruikshank (1987), Carlson (1999), Innes (1999), Gray (1989)	A clear process of selection; Need for inclusiveness, need to limit the size
	Adequate resources	Susskind & Cruikshank (1987), Carlson (1999), Innes (1999), Amy (1987), Mattessich et al. (2001)	Need for adequate resources; Need for the adequately trained facilitator
	Joint ownership	Mattessich et al. (2001), Gray (1989)	Collective responsibility for the outcome
Consensus phase	Clear ground rules	Lowry, Adler, & Milner (1997), Mattessich et al. (2001)	Clarity about how decisions are made; Participants set ground rules
	Shared purpose	Innes (1999), Innes & Booher (1999), Mattessich et al. (2001)	The purpose should be real, practical and shared by the group
	Joint-fact finding	Erhmann & Stinson (1999), Gray (1989)	Participants work together to determine, how data should be collected, analyzed, and interpreted
	The common understanding of conflict	Erhmann & Stinson (1999), Gray (1989)	Need to reach consensus on the problem to move forward
	Respectful interaction	Innes (1999), Mattessich et al. (2001)	Should include face-to-face discussions where participants are listened to and shown respect.
Preliminary outcomes	Creativity/Challenges assumption	Innes (1995), (1999), Innes & Booher (1999)	Enables and encourages participants to "think outside the box."
	Group learning	Forrester (1992), Lowry, Adler, & Milner (1997)	Participants have the opportunity to learn from each other and to create a "transformation of awareness."
	Social capital	Innes & Booher (1999), Innes (1995), (1999)	Personal and working relationships and networks are established

Public participation is supported by several theories such as empowerment[19], equity[20], power[21](Webler, 1999), communication (Webler, 1999), and social learning (Ansell, 2011, as

[19] *"Empowerment is an intentional, ongoing process centered in the local community, involving mutual respect, critical reflection, caring, and group participation, through which people lacking an equal share of valued resources gain greater access to and control over those resources."* (Cornell Empowerment Group, 1989, as cited in Zimmerman, 2000, p. 43). Rapport (1984) argues that empowerment can happen at *"individual, organizational and community levels"* (Rapport, 1984, as cited in Zimmerman, 2000, p. 43). Community empowerment *"refers to collective action to improve the quality of life in a community and to the connections among community organizations and agencies."* (Zimmerman, 2000, p. 44).

[20] While equity, equality, inclusion, diversity, justice, and fairness have been used as synonyms, Putnam-Walkerly and Russell (2016) claim that they are different. They defined equity as: *"access to opportunity, networks, resources, and supports- based on where we are and where we want to go."*

[21] Equity and power theories have some overlap in the social exchange theory, as well (Stolte & Emerson, 1977, as cited in Social exchange theory, Wikipedia, 2017).

cited in Quick & Bryson, 2016, p. 4). Participation evaluation is mostly based on criteria that are derived from theory rather than the participants' opinions (Chase, Decker, & Lauber, 2004, as cited in Reed, 2008, p. 2421). For this reason, Chess and Purcell (1999) compared public meetings, workshops and citizen advisory committees based on theoretical evaluation criteria. The results showed that these participatory methods have similar effectiveness. However, it is undeniable that these methods are different in their communication methods and the created interactions in the community planning process (Chess & Purcell, 1999, p. 2685, as cited in Reed, 2008, p. 2421). Also, engagement of specific stakeholders was a determining factor in the effectiveness and success of a method (Brody, 2003, as cited in Reed, 2008, p. 2421).

Public participation can be either evaluated based on the criteria that are derived from participation theory, users' satisfaction (Laurian & Shaw, 2008 as cited in Ambrose, 2013, p. 20), or evaluators investigate quality of the outcomes in comparison to the criteria that has been set prior to the implementation of the project (Lennie, Tacchi, Koirala, Wilmore & Skuse, 2011, p. 3). Also, the evaluation can be implemented during the participation practice (Beierle & Cayford, 2002, as cited in Evaluate public involvement activities, 2003). In case of web-based participatory projects such as WPPGIS, users should be involved in the evaluation process through an online survey asking their opinion regarding the quality of participation and whether it has been satisfactory for them or not (Ambrose, 2013, p. 3).

Based on an extensive evaluation of 35 cases of participatory decision-making by Fritsch and Newig (2012), the participants' support of the process and achieved outcomes of a participatory decision-making is essential determinant of the effectiveness and success of participation (Fritsch & Newig, 2012, as cited in Reed, 2008, p. 2421).

Public participation is not a single event; it is part of a more significant decision-making system (Public participation guide: Introduction to Public Participation, 2018). For this reason, effective decision-making might be different from successful public participation practice. For instance, more intense public participation creates less efficient decision-making process, or more flexible decision-making makes its results less reliable (Renn, Webler, & Wiedemann, 1995, p. 109).

Rowe and Frewer (2000) evaluated participation methods based on "*acceptance and process criteria*" (Rowe & Frewer, 2000, p. 11). Acceptance criterion which is based on participants' intention toward certain qualities in the participation process, measures *representativeness*, *independence*, *early involvement*, *influence* and *transparency* in a participatory process (Rowe & Frewer, 2000, p. 12). Furthermore, indicators that measure quality and effectiveness of participation procedure included *resources accessibility*, *task definition*, *structured decision-making* and *cost-effectiveness* (Rowe & Frewer, 2000, p. 15). While the current thesis found the Rowe and Frewer's (2000) proposed criteria relevant to the WPPGIS evaluation, each criterion of the *acceptance* has been briefly explained:

➢ Representativeness

The opportunity to participate in the affected population should be fair. As a result, a representative sample of the impacted community should be selected (Rowe & Frewer, 2000, p. 12). However, the process of creating a representative sample can be challenging as there are a substantial tendency toward marginalizing groups of the community that are already isolated or impacted by the ones in power (Vaughan, 1993, as cited in Rowe & Frewer, 2000, p. 15), such as "*intelligent, motivated, self-interested, and unrepresentative elite* (Freudenberg & Olsen, 1983, as cited in Rowe and Frewer, 2000, p. 12). Furthermore, in a representative sample, it is essential to balance the extent of including different opinions. Presenting all the different views might disinfect and weaken the importance or influence of the more commonly-held views (Rahl, 1996, as cited in Rowe & Frewer, 2000, p. 13).

➢ Independence

Facilitators of the participatory process and evaluation should be independent of the implementers and managers of the project (Rowe & Frewer, 2000, p. 13). Such independence helps the evaluators to conduct an unbiased evaluation process (Nelkin & Pollak, 1979, as cited in Rowe & Frewer, 2000, p. 13).

➢ Involvement

Soon after deciding on the primary objectives of the project, participation implementers should engage the public in the process (Rowe & Frewer, 2000, p. 14). However, in practice, it might not be possible to engage the public at its earliest time (Ng & Hamby, 1997; Middendorf & Busch, 1997, as cited in Rowe & Frewer, 2000, p. 14). As one of the prominent cases of the necessity of involving the public in the early stages of the formation of a decision is when the public is consulted about the siting of hazardous waste or nuclear power plant (Rowe & Frewer, 2000, p. 14). In such cases, the earliest participation is designed to discuss the necessity of such conflicting site rather than deciding about its location (Lake & Disch, 1992, as cited in Rowe & Frewer, 2000, p. 14). Early involvement is especially critical when sponsors get validated based on their success in persuading the public to engage in the process (Rowe & Frewer, 2000, p. 14).

Even though it is recommended to be inclusive and involve all the opinions in the decision-making, considering all the perspectives might make decision-making challenging (Chakra-borty & Stratton, 1993, as cited in Rowe & Frewer, 2000, p. 14). For each participatory decision-making, there is an optimum amount of variety of views (Rowe & Frewer, 2000, p. 14). Exceeding the number of collected viewpoints from that optimum or *"appropriate level"* might cause conflicts in the process (Rowe & Frewer, 2000, p. 14).

➢ Influence

Effective public participation should result in some recommendation for policies (Crosby, Kelly, & Schaefer, 1986; Fiorino, 1990; Wiedemann & Femers, 1993; Smith, Nell, & Prystupa, 1997; Ng & Hamby, 1997, as cited in Rowe & Frewer, 2000, p. 14). It is mainly assumed that the participation is a way for authorities to achieve credibility to their decisions (Rowe & Frewer, 2000, p. 14). The public has an issue trusting participation implementers regarding their intention and whether they are collecting their opinion to pretend consultation with the public before deciding on an issue (Rowe & Frewer, 2000, p. 15). Implementers should explicitly agree with the public on how they are going to treat the collected recommendations and whether and how the public might influence the policies (Rowe & Frewer, 2000, p. 15).

➢ Transparency

Transparency clarifies the procedure of the decision-making (Frewer, 1999, as cited in Rowe & Frewer, 2000, p. 15).

In theory, there is no determined standard of the effectiveness of PPGIS (Sieber, 2006, as cited in Rinner & Bird, 2009, p. 592). As a result, Sieber's (2006) proposition insisted on investigating PPGIS effectiveness as a helpful step in agreeing on a standard definition of PPGIS (Sieber, 2006, as cited in Rinner & Bird, 2009, p. 592). Jankowski and Nyerges (2003) researched the possibility of designing a method to practically evaluate PPGIS (Jankowski & Nyerges, 2003, as cited in Rinner & Bird, 2009, p. 592).

There are several impacting factors on the quality of public participation throughout the decision-making process (Reed, 2008, p. 2424). For instance, participation objectives, types of selected stakeholders, extensity and level of implemented participation can influence the quality of the engagement (Reed, 2008, p. 2424). Deciding about the desired intensity of involvement guides authorities to choose the relevant methods, as well (Reed, 2008, p. 2424). Based on the selected method, quality of participation can differ (Reed, 2008, p. 2424). The relation between the agreed participation objective and choice of the method are explained in several of the participation categorization systems (e.g., Arnstein, 1969; Biggs, 1989, Pretty, 1995, as cited in Reed, 2008, p. 2424).Furthermore, there are examples and recommendations on which method to be chosen for the desired level of engagement (Reed, 2008, p. 2424). Rowe and Frewer (2000) summarized recommended methods to be applied to achieve a specific level of engagement including communicating with the public, consulting, and participating with stakeholders in the decision-making process (Rowe & Frewer, 2000, as cited in Reed, 2008, p. 2424).

Choice of method is also affected by a *"changing context"* (Richards, Blackstock, & Carter, 2004, as cited in Reed, 2008, p. 2425) of the decision-making, available *"time and resources, power dynamics of the groups, and level of engagement"* (Reed, 2008, p. 2424).

The specific characteristic of each participatory decision-making dictates its required methodology (Reed, 2008, p. 2424). For instance, in a group with lower education status or literacy, the methodology should fit their capability in reading and comprehending materials (Reed, 2008, p. 2424). The structure of the power in each group affects the way in which people

express their opinions and participate in decision-making (Reed, 2008, p. 2424). As a result, public participation if not appropriately managed, might be marginalizing for those who have less power or access to resources (Reed, 2008, p. 2424). When people are left out of the decision-making equilibrium in their community, they might not accept the final decisions, and the resulted conflict makes issues in the successful implementation of the decisions (Cupps, 1977; Turner & Weninger, 2005, as cited in Reed, 2008, p. 2424).

Each method should be specified for each participatory decision-making initiative (Reed, 2008, p. 2424). For instance, Reed et al. (2008) who were holding participatory meetings in Botswana, had to separate the meetings based on gender, because of the cultural taboo required to have separate meetings for men and women (Reed et al., 2009 as cited in Reed, 2008, p. 2425).

The requirements of participatory decision-making and its proper methods might change unexpectedly, and the implementers should prepare themselves for those situations (Richards, Blackstock, & Carter, as cited in Reed, 2008, p. 2425). For example, it is not uncommon in the decision-making projects that authorities discover new facts about the target community such as disability, literacy, or cultural limitations and enforces specific changes to the whole process (Reed, 2008, p. 2425). In an evaluation project, Dougill et al. (2006) had to change the methodology to more simple discussion sessions because the previously planned method was complicated for the level of their skill and knowledge (Dougill et al., 2006, as cited in Reed, 2008, p. 2425).

If a hypothetical participatory process could meet all the possible criteria of good participation, it might be considered a successful process (Chase, Decker, & Lauber, 2004, p. 635). However, good participation has a fluid, and context-based definition and its related evaluation criteria have different importance (Chase, Decker, & Lauber, 2004, p. 635). For instance, it might be based on the pre-set objectives of the project or participants' preferences to participate in an inclusive process. Then inclusiveness is the most important criteria to determine proper participation methods and requirements of the process to meet this objective (Chase, Decker, & Lauber, 2004, p. 635). Furthermore, review by Chase et al. (2004), participants put

different weight on success criteria. For instance, transparency and accountability are highly regarded components of a good participatory process (Chase, Decker, & Lauber, 2004, p. 636).

Ambrose (2013) attempted to evaluate the effectiveness of public participation methods (Ambrose, 2013, p. 25). By evaluating most popular techniques such as open house, focus group discussion (FGD), and crowdsourcing she concluded that different participatory techniques might follow similar objectives. For instance, *"mutual learning, democracy, governance, and significant social outcomes"* are common goals of public participation (Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 1). Ambrose (2013), then extracted 13 effectiveness criteria from Laurian and Shaw's process-based and outcome-based participation goals (Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 1).

In response to the lack of proper evaluation method of web-based public participation, Aichholzer and Westholm (2009) investigated 30 cases of EParticiption in the European Union to propose an evaluation framework (Aichholzer & Westholm, 2009, p. 1). In their evaluation they found out that most of the applied evaluations of EParticipation are either focused on specific criteria such as *"transparency and accountability"* (Pina, Torres, & Royo, 2007, as cited in Aichholzer & Westholm, 2009, p. 2), *"governance"* (Skelcher, Mathur, & Smith, 2005; Schmitter, 2005, as cited in Aichholzer & Westholm, 2009, p. 1), or *"quality of democracy"* (Coppedge & Reinicke, 1990; Diamond & Morlino, 2005, as cited in Aichholzer & Westholm, 2009, p. 1). Those criterions might be relevant to evaluating online participation, but in practice, they have not been explicitly modified for evaluating EParticipation (Aichholzer & Westholm, 2009, p. 1).

EParticipation evaluation framework that was introduced by Aichholzer and Westholm (2009) was part of the DEMO-net project (Lippa et al., 2008, as cited in Aichholzer & Westholm, 2009, p. 1). The framework was resulted from reviewing several evaluation frameworks and selecting relevant criteria that were applicable to EParticipation (Aichholzer & Westholm, 2009, p. 1). Practically, it was not possible to apply Aichholzer and Westholm's evaluation framework (Aichholzer & Westholm, 2009, p. 1). As a result, they decided to combine it with EVOICE project of four-year EParticipation practices in 30 municipalities within European countries (Westholm, 2008, as cited in Aichholzer & Westholm, 2009, p. 1).

However, in the results of the EVOICE[22] showed that government mostly applies several communication channels including online and offline methods (Westholm, 2008, as cited in Aichholzer & Westholm, 2009, p. 1). The advantage of the Aichholzer and Westholm's framework is considering critical differentiating factors in the quality of communication for participation such as culture and governance (Aichholzer & Westholm, 2009, p. 1). As a result, their recommended framework can be considered applicable for the evaluation of other settings such as good participation in WPPGIS projects, as well (Aichholzer & Westholm, 2009, p. 1).

Variety of tools were used to communicate with the public in the EVOICE project. However, offline participatory meetings were more favorable for political participation (Aichholzer & Westholm, 2009, p. 9). It seemed that the primary applicable approach for political participation in the EVOICE is offline meeting supplemented by online contribution (Aichholzer & Westholm, 2009, p. 9). The lower tendency toward using online system in

[22] 30 cases of EParticipation that were applied by several municipalities in Netherlands, Germany, Sweden, Belgium, and UK used multimedia dialogue approach (MMDA) between 2004 and 2008 (Aichholzer & Westholm, 2009, p. 2). Evaluation of EVOICE (the voice of the citizen in the multimedia information society) was conducted by reviewing the activity and discussion reports. This review and observation was implemented by a group as third-party who would not benefit from any grant or have relation with any of the involved parties (Aichholzer & Westholm, 2009, p. 3). To complete the information of activity reports, evaluators personally visited the cases, collected minutes of each meeting, and interviewed informants and experts regarding to the quality and effectiveness of participation, adding the collected information of online activities the EParticipation case studies (Aichholzer & Westholm, 2009, p. 3). The applied MMDA in EParticipation is a *"divergent communication process"* that facilitates communication with different stakeholders (Dennis & Valacich, 1999, as cited in Aichholzer & Westholm, 2009, p. 5). Such process is proper for communicating with specific target group or focusing on specific problem (Aichholzer & Westholm, 2009, p. 5).

Prior to the evaluation, interviewees assumed that the discussion forum on EParticipation is helpful for the communication of different non-related groups (Aichholzer & Westholm, 2009, p. 5). However, the evaluation results showed that compared to the visits to the website, participation rate in the forums was non-significant (Aichholzer & Westholm 2009, p. 5).

Haklay and Tobon (2003) recommend the consideration of Human-Computer Interface (HCI) standards for researching Web-based PPGIS (Haklay & Tobon, 2003, as cited in Tang & waters, 2005, p. 10). General public are not equal in their computer skills. As the result, it is necessary to review closely their *"interface design"* and develop software and websites compatible with different skill levels (Tang & Waters, 2005, p. 56). In the application of WPPGIS for transportation system, Tang and Waters (2005) observed that public are more interested to engage in using the WPPGIS if its design has considered usability (*"user-friendly"*) and matches with the users' skill level (*"flexibility"*) (Tang & Waters, 2005, p. 56).

In the evaluation of MMDA by Aichholzer and Westholm (2009), the public assessed the system to be trustworthy and usable for communication (Aichholzer & Westholm, 2009, p. 5). However, not all the opinions could be included in the conclusion. For instance, seniors and migrants was specific to that target group and were excluded from generalizing to the whole community (Aichholzer & Westholm, 2009, p. 5).

countries with high computer literacy was an inconclusive result (Aichholzer & Westholm, 2009, p. 9).

Steinman et al. (2004) evaluated the quality of communication, operation, and visualization of 12 case studies of PPGIS (Steinman, Krek, & Blaschke, 2004, as cited in Rinner & Bird, 2009, p. 591). Bugs, Granell, Fonts, Huerta, and Painho (2010) developed an online PPGIS application with discussion forum and tested its usability within a group of stakeholders in Canela (Brazil) (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 173). They used more commonly used evaluation criteria to acquire stakeholders' opinion on the usability of the system for participatory planning (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 177). The evaluation criteria included the cost of entry, intended users, ease of use, satisfaction, and usefulness (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 177). The results of the interviews showed that the stakeholders firmly believed that the web-based PPGIS is applicable for planning purposes and they can use and comprehend it easily Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 180).

Burton (2009) studied the hypothesis that public participation at a local scale is more meaningful (Burton, 2009, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). The results showed that by decreasing the number of participants and limiting them to the local scale, the intensity of the participation should increase to fully acquire the opinion of the most impacted localities (Burton, 2009, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). Revolutions in the American development and planning policies in the 1960s and 1970s (e.g., Development Act of 1974), necessitated decentralization of Federal government and transferring local issues to local municipalities for the resolution (Peterman, 2000, as cited in Ambrose, 2013, p. 8). Neighborhood planning was consequently introduced (Ambrose, 2013, p. 8). Rohe and Gates (1985) investigated the characteristics of neighborhood planning in comparison to city planning and concluded that decreasing the scale of the planning makes the government more responsive to specific issues (Rohe & gates, 1985, as cited in Ambrose, 2013, p. 9). Also, citizens show more interests to participate in the decision-making for their community and in this way interactions between authorities and communities improve (Rohe & gates, 1985, as cited in Ambrose, 2013, p. 9). While the number and scale of the participation decrease in neighborhood planning, it is believed that the participation can be implemented more meaningful and effectual (Ambrose, 2013, p. 9).

However, there is not enough evidence to support this assumption (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19). Scale and determination of neighborhood borders are project specific criteria (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 20). However, the idea of increasing the number of the participants in a broader geographic area is prevalent in community planning projects (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 18). It seems that there are not many studies explicitly examining the impact of the project scale on effectiveness and efficiency of the applied participation methods and it remains the decision of the participants and authorities to decide about each project, individually (Shipley & Utz, 2012, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4).

In a study by Tang and Liu (2016), they found out the relationship between *number* of the users, the intensity of the accessible information and online interactions in a WPPGIS project that enhances the quality of the participation opportunities for stakeholders (Tang & Liu, 2016, p. 1076). Tang and Liu (2016), then used the three criteria of *number* of the users, information and online interactions to evaluate WPPGIS projects (Tang & Liu, 2016, p. 1076).

Among several case studies of WPPGIS evaluation, Kahila-Tani, Broberg, Kytta, and Tyger (2016) implemented an online survey within a WPPGIS project in Helsinki. 3745 participated in the survey (Kahila-Tani, Broberg, Kytta, & Tyger, 2016, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 5). The sampling was targeted toward younger and more educated people. The final result was not applied for actual city planning (Kahila-Tani, Broberg, Kytta, & Tyger, 2016, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 5).

In a study by Stern et al. (2009), supplementation of an online forum with the public meeting was investigated. The result showed that providing both types of interactions (online and offline) increases the participation rate (Stern, Gudes, & Svoray, 2009, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 5). Although the interaction was one-way in their designed online forum, in their survey people showed more interest (trust) to online participation (Stern, Gudes, & Svoray, 2009, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 5).

Also, in another study by Brown et al. (2014), the results of two types of mapping practice in online and offline modes were compared. Individuals were more interested in online mapping, and the result of offline group mapping was different from individual online mapping (Brown et al., 2014, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 5).

Jankowski et al. (2015) evaluated participation through geo-questionnaire[23] and geo-discussion[24] (Jankowski, Czepkiewicz, & Mlodkowski, 2015, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 6) which are recommended methodology by Rinner (2001) in his ArguMap (Rinner, 2001; Rinner & Bird, 2009; Hall & Leahy, 2008, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 9). Geo-questionnaire collected information on land use preferences of the Poznan community, and the geo-discussion was an attempt to further investigate the residents' opinion regarding development in the area (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). Geo-discussion in their research was with an interactive map which was representing graphical features of the proposed plan (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). Demographic characteristics of the users and *"scalability*[25]*"* of online participation were analyzed to have a better view on the differences between online and offline participation. (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). The evaluation result showed that participants who were mostly young were more interested in using the online system for participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). Level of education and participation had no significant relevance to

[23] *"A geo-questionnaire is a web application comprised of an online questionnaire coupled with an interactive map that enables data collection of two types: object (point, line, area) descriptions linked to geographical features, and descriptions without an explicit spatial reference* (Jankowski, Czepkiewicz, & Mlodkowski, 2015, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 8).

[24] *"A geo-discussion is a web application comprised of a structured discussion forum coupled with an interactive map, allowing annotation of the map with geometric objects (point, line, area) linked to discussion contributions* (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 8).

[25] *"Spatial scalability or scaling public participation up, denotes the capability to draw participants from a geographically wider area than one would expect using an assumption that local planning issues primarily attract the participation of residents who live within or near the plan area."* (Nyerges & Aguirre, 2011, as cited in Jankowski et al., 2017, p. 10).

gender (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). While online mode increases the number of people who might participate in the decision-making, it can be considered more scalable (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 10). Older participants and senior citizens preferred offline participation as the dominant method of interaction with authorities (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 11).

It seems for both offline and online modes of participation, the proximity to the planning area is a strong motivation to participate in the project (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 12). Based on the *"Average Nearest Neighbor Index"* online participation shows more clustered participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 12). In summary, the primary results of the evaluation showed that local people were more interested in participating in the issues that were related to their neighborhood (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 12). Also, in opposition to the primary assumption, the distribution of the participants in online mode was lower (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 12). Familiarity with the community and proximity of their distance to the problematic area are the two-strong motivations for first online participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 13).

Furthermore, Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, and Wojcicki (2017) implemented several interviews with municipal planners to collect their views on whether they are going to use public output in the final decision, how the participation can increase knowledge and trust among participants, and if they are satisfied with the whole evaluation process (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 14). The evaluation criteria, in general, were inclusiveness, representativeness and the relation between timing of the participation and planning (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 14).

The observed advantage of online participation application in Jankowski's (2017) research was increased transparency and trust between planners and the public through exchanging of more accurate and updated information with the public (Jankowski, Czepkiewicz,

Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16). On the survey, people stated that engaging more public in the decision-making and providing new methods of participation is what makes online participation their popular method (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16). Through online forums, people could share and express their personal preferences and ideas that might be conflicting in face-to-face participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16). While different groups of the public had different preferences regarding their popular participatory methods, planners concluded that implementing offline and online methods together are more beneficial (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 16). However, exclusion of some groups who prefer online mode but are limited to offline participation due to their insufficient technical skills was disadvantageous to online participation (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 18). Planners also found online participation a useful tool to communicate with the broader public and a trustworthy and convenient way to collect legitimate opinions of the citizens in their planning projects (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 18). Unfortunately, due to the better scalability capability of the online participation, planners tend to misuse it as a representative sample of the impacted community (Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19).

To test the efficiency of PPGIS, Gardevarn (2017), compared quality and effectiveness of participation through traditional public meetings and participatory decision-making facilitated by mapping practice (PPGIS) (Gardevarn, 2017, p. 1) in Helsingborg, Sweden. The tested criteria included transparency, representativeness, independency, impact on the final decisions, the process of decision-making, and review of cost-effectiveness (Rowe & Frewer, 2000, as cited in Gardevarn, 2017, p. 14). The results showed that PPGIS is more efficient than applying single public meetings. However, he recommended using both methods together to increase the efficacy of the methods (Gardevarn, 2017, p. ix).

Good participation

There are several terms that are used interchangeably and seem to be synonyms. Good participation (Webler, Tuler, & Krueger, 2001, p. 435; Snook & Mongiat, 2010; Lukensmeyer,

Goldman, & Stern, 2011, p. 14), effective community-based management (Sultana & Abeysekera, 2008, p. 211), fair participation (Renn, Webler, & Wiedemann, 1995, p. 41; Webler & Tuler, 2000, p. 570), competent citizen participation (Renn, Webler, & Wiedemann, 1995, p. 41; Webler, Tuler, & Krueger, 2001, p. 435; Webler & Tuler, 2000, p. 571; Habermass, 1987, as cited in Reed, 2008, p. 2419; Brenneis, 1990, p. 36; Abelson & Gauvin, 2006, p. 5), successful collaboration (Beierle & Cayford, 2002, as cited in Abelson & Gauvin, 2006, p. 6; Bracht & Tsouros, 1990, as cited in McGee, 2009, p. 26; Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 8; Chess & Purcell, 1999, p. 2685; Baker, Coaffee, & Sherriff, 2007, as cited in Evans-Cowley & Hollander, 2010, p. 406; Jankowski & Nyerges, 2003, p. 14; Richards, Blackstock, & Carter, 2004, p. 21; Tang, 2006, p. 2; Twitchen & Adams, 2011, p. 2; McCool & Guthrie, 2001, as cited in Brody, 2003, p. 418; Carnes, Schweitzer, Peelle, Wolfe, & Munro, 1996, as cited in Chase, Decker, & Lauber, 2004, p. 631; Creighton, 2005, p. 60; Craig, Harris, & Weiner, 2002, as cited in Jankowski & Nyerges, 2003, p. 9; Tang & Waters, 2005, p. 8; Crosby, Kelly & Shaefer, 1986, p. 171), adequate stakeholder-based decision-making (Beierle, 2002, p. 739; Lukensmeyer, Goldman, & Stem, 2011, p. 14), appropriate participatory process (Webler & Tuler, 2006, p. 699; Ramasubramanian, 2008, p. 152; Lynam, de Jong, Sheil, Kusumanto, & Evans, 2007, as cited in Reed, 2008, p. 2424), legitimate participation (Lynn & Kartez, 1995, p. 88; Creighton, 2005, p. 20; Webler, Tuler, & Krueger, 2001, p. 441; Shipley & Utz, 2012, p. 30; Lave & Wenger, 1991, as cited in Bers, 2008, p. 159), deliberative engagement (Nabatchi, 2012, p. 32 ;Laurian & Shaw, 2009, p. 293 ;Lukensmeyer & Hasselblad, 2006, p. 9; Abelson & Gauvin, 2006, p. 12; Halvorsen, 2003, p. 537; Hartz-Karp & Sullivan, 2014, p. 2), transparent participation (Gardevarn, 2017, p. 34; Lukensmeyer, Goldman, & Stern, 2011, p. 40), popular participation (Burton, 2009, p. 270; Turkucu, 2008, p. 31; Warner, 1997, p. 413; Kalof, 1997, p. 101), and complete involvement (Laurian & Shaw, 2009, p. 303; Hadden, 1995, p. 243).

However, there is no mandated guideline on how to define, implement, or evaluate an efficient, good or appropriate participatory process (Lukensmeyer, Goldman, & Stem, 2011, p. 14). The main issue with terms and fuzzy concepts such as good participation is because they can not provide precise and standard definitions to make them usable for standard collaborative decision-making systems such as community planning (Tang & Waters, 2005, p. 56).

The origin of the term of *good participation* is unknown. Kelsey Snook and Melissa Mongiat (2010), as independent public participation advocates, for instance, applied it in their project to convey how based on the project's outcome, participants' satisfaction, and knowledge dissemination in the participatory process, they could evaluate it to be good participation (Snook & Mongiat, 2010): "*..as an investigation of our practice - when we get a project right when the client walks away happy when audiences love the experience when the right messages are driven home when people spread the word and come back for more - what makes it a success? We've called the general principle of that success 'Good Participation*".

Snook and Mongiat (2010) argue that participation as an interactive and engaging experience. Such qualities in participation experience make it good participation (Snook & Mongiat, 2010). Lack of a standard definition of good participation necessitates the precise definition of effective and meaningful participation for each participatory decision-making project (Lukensmeyer, Goldman, & Stern, p. 33). However, there are not many cases that have attempted to provide that definition (Lukensmeyer, Goldman, & Stern, p. 33). Also, the participatory methods are not standardized as well. The result is a confusing experience for practitioners and participants (Lukensmeyer & Hasselblad-Torres, 2006, p. 45). Adding to all those problems is a different pool of words and terminology that planners and participants use to refer to a good participatory experience (Tang & Waters, 2005, p. 56).

The lack of standard encourages participation initiators to set their standards and follow their crafted guideline to implement an effective and competent public participation (Lukensmeyer & Hasselblad-Torres, 2006, p. 45). As an example of a guideline for adequate public participation EPA mandated the following steps (EPA, 2010, p. 7):

➢ The stakeholders should be engaged early to the whole of the decision-making process, and this engagement should continue throughout the process;
➢ Authorities are responsible for determining stakeholders and contacting them in proper time and manner;
➢ Participants are not equal in their needs. As the result implementers should financially and technically assist participants during their engagement;

➢ In developing alternative resolutions, the public should be engaged actively. Also, before taking decisions, the public should be consulted about their recommended alternatives;

➢ Resolutions should be crafted and developed from the public's input;

➢ Each participatory decision-making is a unique event and needs to be explicitly designed for that circumstance;

➢ Public participation is beneficial to all groups of governors and authorities to local communities and tribal groups. Promotion and development of such widely applicable approach require cooperation and partnership with diverse groups.

While EPA recommends following the guideline for effective participation as precisely as possible, it also suggests for specializing each participatory decision-making initiative based on its requirements and necessities (EPA, 2010, p. 7). As a result, deciding about what consists good and effective participation is the implementers' decision. In EPA's standards, stakeholders do not have an influential role in determining what constitutes good participation and it can weaken the strength and acceptability of such standards.

In another attempt to organize adequate public participation, Lukensmeyer and Hasselblad-Torres (2006) listed a mandate for effective public engagement (Lukensmeyer & Hasselblad-Torres, 2006, p. 44):

➢ Initiators and implementers should act as a focal point to provide accurate and up-to-date information;

➢ Include more diverse groups of participants; Diverse groups should be engaged to make it more inclusive;

➢ Opportunities for involvement should be open, encouraging and unbiased to facilitate the participation of all groups;

➢ Regardless of demographic characteristics, social status and marginalizing factors, implementers should provide equal opportunity to all stakeholders;

➢ Recognize local preferences, values, limitations, and restrictions, and share them before the participation;

➢ It is a principle to check whether the final decision or policy has considered public perspective and preferences;

➢ Inform the public of the result and final decision; and

➢ Participatory decision-making is not considered complete unless its process and outcome were evaluated.

Similar to mandating effective decision-making process, there are several other studies that provide guidelines for implementing successful participatory decision-making or specifically PPGIS (Gastil & Levine, 2005; Koontz, Carmin, Steelman, & Thomas, 2004; Sabatier, 2005, as cited in Webler & Tuler, 2006, p. 700). Carver, Evans, Kingston, and Turton (2001) and Peng (2001) for instance, list some recommendations to implement a better PPGIS (Carver, Evans, Kingston, & Turton, 2001; Peng, 2001 as cited in Rinner & Bird, 2009, p. 591). In summary, those recommendations include (Rinner & Bird, 2009, p. 591):

➢ Experiencing with geographical data and discussion on possible alternatives and potential scenarios on some forums would enhance the quality of participation;
➢ Simplify data to make them more comprehensible. However, neutrality of the provided should be maintained;
➢ Creating a transparent process, that participants can express their opinions and follow the process to see how their input might impact the final decision can improve the trust among the public and those who have the decision-making power.

Good participation is rarely considered in decision-making projects. However, in the limited cases, the good participation has been discussed as a process rather than investigating the impacts of good participation on outcomes (Beierle, 2002; Renn, Webler, & Wiedemann, 1995; Rowe & Frewer, 2000, as cited in Reed, 2008, p. 2421). Based on the theory of public participation and limited definition of good participation it can be assumed that when all the various opinions are considered during participation to facilitate reaching to a consensus in the decision-making then the good participatory process has reflected its impacts on the outcome (O'Connor, Schwartz, Schaad, & Boyd, 2000, p. 4).

Good participation has a fluid and changing definition based on the goals of each project (Snook & Mongiat, 2010). Meeting the pre-set goals and objectives then is considered success in that project and implementers can evaluate their initiative to be good participation (Snook &

Mongiat, 2010). For instance, some of the success factors that might be interpreted as good participation criteria including:

- ➢ Encouraging participants to come out of their comfort zones and engage in community-related activities that they might not consider important;
- ➢ When participants have been informed precisely what is their role in the decision-making and how much they might impact decisions;
- ➢ When participants and authorities trust each other to agree on their desired outcomes;
- ➢ When the sense of the ownership of the project increases;
- ➢ When the impact of the decision-makers and the participants on the final decisions is meaningful and realistic;
- ➢ When participants fully engage in the process that they can provide creative solutions and alternative approaches;
- ➢ When participants appreciate previous actions and can see and place their recommended actions in line with what has been done previously;
- ➢ When participants understand that their involvement makes a difference and they can improve the result by their active engagement;
- ➢ When participants feel that their presence in the decision-making process and their active involvement is essential;
- ➢ When participants can appreciate the authorities' effort to improve the quality of life in their community;
- ➢ participants like the participation experience that they want to advocate such initiatives;
- ➢ When participants are ready to engage in another similar process and want to repeat their satisfactory experience;
- ➢ When participants have the motivation to continue cooperating with the project to the end and are curious to acquire information on the result;
- ➢ When participants satisfied with the results and promoted the whole project;
- ➢ When oppositions and conflicting opinions change through a consensus-building process in the decision-making;
- ➢ When the sense of belonging to the community strengthens;
- ➢ When the participation improves particular skills and capabilities in participants;

➢ When participants accept new roles as initiators of public participation and eagerly look for further opportunities to devote their time and energy to community planning.

While outlining requirements of a good public participation process are beneficial to increase the effectiveness and satisfaction in a process, still it is essential to decide whether implementing authorities' desire is the primary determinant to evaluate a participatory process successful and whether merely empowering participants during the process is enough to consider a participatory process successful even if it has not achieved its objectives? (Snook & Mongiat, 2010). It seems that Snook and Mongiat (2010) are recommending that the definition and evaluation of good participation is the decision of the participants and implementors and cannot be prescribed in general (Snook & Mongiat, 2010). Furthermore, it is recommended to consider the requirements of good participation all throughout the whole process rather than focusing on proper participatory process or effectiveness of the outcomes (Snook & Mongiat, 2010).

One of the first attempt to determine characteristics of good public participation conducted by Webler, Tuler, and Kruger (2001). In their research, they found out that reaching agreement in a project about main determinants of good participation is challenging (Webler, Tuler, & Krueger, 2001, p. 435). Unsuccessful attempts to reach to an agreed definition of good participation also makes evaluation and determination of success or failure of a project difficult if not impossible (Webler, Tuler, & Krueger, 2001, p. 435). Webler, Tuler, and Krueger (2001) selected two cases of forestry in New England and New York and investigated characteristics of the good participation by using Q methodology[26] (Webler, Tuler, & Krueger, 2001, p. 435). Some of the central discourses[27] derived from discussions and interviews with participants included (Webler, Tuler, & Kruger, 2001, p. 441):

➢ A good participatory process attempts to attain the public's acceptance;

[26] *"A form of factor analysis used to study subjective viewpoints among participants."* (Q Methodology, 2017) *"The Q method is well suited to uncovering patterns of belief situated within people's subjectivity. Unlike most survey methods, which ask a respondent to express a view on separate statements, in this type of study individuals react to statements in the context of all statements included in the study. This provides a researcher with a holistic perspective of a person's subjectivity regarding a research question."* (Webler, Tuler, & Krueger, 2001, p. 437)

[27] *"Discourses are shared, structured ways of speaking, thinking, interpreting, and representing things in the world (also called: frames, speech genres, interpretive repertoires, or simply, perspectives)."* (Webler & Tuler, 2001, p. 31)

➢ The good process provides an opportunity to confront conflicting opinions and facilitates open discussions about conceptual disagreements;

➢ Good participatory process threats all the stakeholders equally and fairly;

➢ Good participatory processes create a sense of community and encourage cooperation between localities to fight for their community's rights and benefits; and

➢ Good participation should be guided wisely toward reaching to consensus and requires some degrees of compromising for all the stakeholders.

Finally, Webler, Tuler, and Kruger (2001) used the above discourses to define their evaluation criteria of a good public participation process (Table 6). The crafted criteria and derived discourses might be contradictory, mainly because reaching to an agreement on what is considered to be good, and is challenging (Webler, Tuler, & Krueger, 2001, p. 436).

Table 6 Example of deriving good participation criteria from participants' narrative (Webler et al., 2001, p. 439)

Criteria and sub-criteria		**Example statement**
Fairness	Access to the process	*"The more people that are involved, the better the process will be."*
	Power to influence process and outcomes	*"If someone makes a compelling case for something, it should change the course of the outcome."*
Competence	Access to information	*"The Council should gather information about local knowledge and experiences."*
	Structural characteristics to promote constructive interactions	*"Skilled facilitators are needed to keep a constant flow and to keep things on center."*
	Facilitation of constructive personal behaviors	*"Rules about what are acceptable behaviors at meetings need to be enforced."*
	Adequate analysis	*"There should be a peer review of both expert knowledge and local knowledge."*
Outcomes	Enabling of social conditions necessary for future processes	*"The process should promote a regional awareness and a regional sense of place."*

Such contradictory perspectives in very common in decision-making discourses and are not *"mutually exclusive"* (Reed, 2008, p. 2421). The result was similar to other research by Webler and Tuler (2006) who observed different and sometimes conflicting opinions during participatory decision-making (Webler & Tuler, 2006, as cited in Reed, 2008, p. 2421). Among all the disagreements over the definition of good participation, there are characteristics that all stakeholders can agree about (Webler, Tuler, & Krueger, 2001, p. 445; Webler & Tuler, 2006, p. 717). For instance, some of the agreed characteristics of a good process in the forestry case study was inclusiveness and reaching to all stakeholders, accessible and high-quality information for all the involved parties, impacting final decisions with a meaningful participation, and considering all the opinions for crafting and proposing a mediatory decision (Webler & Tuler, 2006, p. 700). However, there are unclarities about the good participation process. For instance, there is not much research on how much leadership, control, and authoritativeness is necessary for good participation? How to deal with the legitimacy of the decisions in comparison to scientific realities? What is the role of initiators and participants in the implementation of good participation? Moreover, how to keep the goals unchanged throughout the whole process? (Webler & Tuler, 2006, p. 699)

The primary importance of the acquired results of Webler, Tuler, and Krueger (2001) research was the fact that there are different opinions about good public participation and it is crucial for participatory decision-making planners to design their project and it's following evaluation criteria to consider such issues. (Webler, Tuler, & Krueger, 2001, p. 447).

While people have a different opinion regarding what constitutes good participation, if a process is designed and implemented close to their perception of a good process, they are more likely to accept and support its outcomes (Webler, Tuler, & Krueger, 2001, p. 448). As a result, authorities should carefully investigate the desires, needs, preferences, and beliefs of potential participants to design their process in a way that can meet the public's expectations of good participation (Webler, Tuler, & Krueger, 2001, p. 448). Also, it is crucial to provide equal opportunities for all the voices to be heard and considered in the design and implementation of a good process (Webler, Tuler, & Krueger, 2001, p. 448).

Bleiker and Bleiker (1995) believe that the three main criteria of good public participation that should be kept consistent throughout the participation process are legitimacy, responsiveness, and responsibility (Bleiker & Bleiker, 1995, as cited in Webler, Tuler, & Krueger, 2001, p. 436).

Legitimacy is maintained through acquiring the public's input while implementing the participatory process (Northern Lands Council, 1994, as cited in Webler, Tuler, & Krueger, 2001, p. 436). Representativeness and inclusiveness are counterparts in providing equal opportunities to include all the diverse voices to make the participation likable by most of the participants (Webler, Tuler, & Krueger, 2001, p. 436). Also, people are more likely to accept the results if they are included in the decision-making process, even though the final result is against their primary preference (Webler, Tuler, & Krueger, 2001, p. 448). As another vital criterion of good participation, Bleiker and Bleiker (1995) believe that authorities and decision-makers should be transparent about how they are going to use public's input (Bleiker & Bleiker, 1995, as cited in Webler, Tuler, & Krueger, 2001, p. 436). Being responsive to the public's expectations and providing feedback on the relation between outcome and the collected opinions, is crucial to achieving public trust for future decision-making processes, as well (Webler, Tuler, & Krueger, 2001, p. 443).

Reed (2008) reviewed best practices in public participation based on the acquired qualities and criteria that were achieved through investigating a Grounded Theory[28] and related literature (Corbin & Strauss, 1990, as cited in Reed, 2008, p. 2422). If the 'best practice' is interpreted as good participation, then the current research can rely on Reed's (2008) conclusion on supplementing good participation practices with empowerment, trust, and mutual learning conceptions (Reed, 2008, p. 2422). However, due to the lack of standard definition of good participation practices, the collected criteria from different sources are inconsistent and still needs further theoretical reasoning and support (Lukensmeyer & Hasselblad-Torres, 2006, p. 45). Setting standards for good participation and mandating a procedure to implement it is

[28] *"A qualitative method used to systematically analyse large bodies of text, to construct theoretical models that are 'grounded' in the text."* (Corbin and Strauss, 1990, as cited in Reed, 2008, p. 2422). Researcher should list some questions, read the text with the intention to find answer to those questions, select the potential answers, set proper keywords for those answers, then combine the keywords to create themes and finally create the theory through those themes (Reed, 2008, p. 2422).

essential because implementers can set their self-evaluation framework to determine how far or close they are from reaching to their pre-set goals and objectives and whether they could conduct a good participatory process.

Understanding the mandatory components of a participatory process is a helpful approach to define a good process and determine criteria for good participation. Straus's (1999) four phases of the participatory process is one of the well-known ones. The four phases include start-up phase, process-design phase, consensus-building phase, and implementation phase (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). Public participation starts when a group of community members or citizens reach to an agreement that there is a problem to solve in their community (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). The public and initiators then should design the participation process, determine stakeholders, notify other parties, and distinguish how the process is going to be implemented (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). To resolve conflicts, facilitate cooperation and actively engage the public in determining options and alternatives, implementers need to conduct the consensus-building discussions and meetings (Schlossberg & Mattia, 2003, p. 3). Similar to any other meeting, people set some basic rules for their engagement (*"joint ownership"*), search for policies and regulations about the issue and their rights and limitations (*"joint-fact-finding"*), collaborate to define the problem realistically (*"common understanding of conflict"*), and finally they might reach consensus or agree on specific actions (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). In the end, the public agrees to implement their agreed resolution (Straus, 1999; Gray, 1989; Margerum, 1999, as cited in Schlossberg & Mattia, 2003, p. 3). After clarifying the components of good participation, a practical guideline can be designed for promoting public participation (Straus, 1999, as cited in Schlossberg & Mattia, 2003, p. 4). By emphasizing on designing a detailed guideline for good participation, Straus (1999) attempts to provide a solution for the success of participatory decision-making (Schlossberg & Mattia, 2003, p. 8).

Lukensmeyer. Goldman and Stern (2011) reviewed reports of the AmericaSpeaks and the IBM Center about political participation to craft a guideline for a good (*"high-quality"*) participation process (Lukensmeyer, Goldman, & Stern, 2011, p. 15). Lukensmeyer, Goldman and Stern (2011) insist on considering the following requirements in a participatory process (Lukensmeyer, Goldman, & Stern, 20011, p. 7):

➢ Proper notification of the problem to the public with accurate information to encourage the stakeholders for expressing their opinions;

➢ Put efforts in inclusively engage diverse groups of affected public;

➢ Engaging authorities and people with the power in decision-making and commit them to consider public's input in the final decision;

➢ Invite and facilitate open and deliberative discussions about the problem;

➢ Craft a draft of the final resolution based on what people have agreed and prioritized in their discussions; and

➢ Continuously maintains the relationship with the public by providing feedback to the public, closely monitor the status of the mediated resolution and engages the public in evaluating the participation process.

While it is necessary to engage public in the evaluation of the participatory projects (Blackstock, Kelly, & Horsey, 2007, as cited in Reed, 2008, p. 2421), Lukensmeyer, Goldman, and Stern's (2011) evaluation was conducted by implementers and the participants had no say in the evaluation, themselves (Ginsberg, 2011, as cited in Lukensmeyer, Goldman, Stern, 2011, p. 55).

Omitting the public from evaluating the process creates an environment that initiators and participants have a different influence on the process and the resulting outcome. As a result, one of the leading principles of the high-quality decision-making which is providing opportunities for the public to influence the final decision cannot be met (Ree, 2008, p. 2421).

Brenneis (1990) evaluated a public participation process for the British Columbia Forest Resource Commission (Brenneis, 1990, p. 1). His main conclusion was that effective participation should be democratic and functional (Brenneis, 1990, as cited in Liu, 2007, p. 21). Democratic participation can happen when the process has met criteria of *"equity, accountability, and representativeness"* and it is functional when the process is considered "*effective, efficient, and acceptable*" by the participants (Brenneis, 1990, p. 33). Reviewing the list of the effective participation components by Brenneis (1990) reveals that it is based on the planners' and authorities' assumption of a good process and missed the public perspective by imposing top-down decision-making components (Brenneis, 1990, p. 33). Ignoring public

perspectives is in contradiction with the central principle of the good participation that Brenneis (1990) framed it as a democratic rationale of participation. Involving the public and their opinion in the process of defining and framing good participation criteria is crucial, mainly because deciding about a participatory topic should be participatory, as well (Blackstock, Kelly, & Horsey, 2007, as cited in Reed, 2008, p. 2421). While there is not still a standard definition of effective or *"appropriate"* participation (Webler & Tuler, 2006, p. 699), Brenneis (1990) listed his evaluation criteria of the good participation by presenting it as the *"desired components of an effective public participation process."* (Brenneis, 1990, p. 33).

By reviewing the literature on several practices and theories of participatory decision-making, Chase, Decker, and Lauber (2004) also listed good participation criteria (Chase, Decker, & Lauber, 2004, as cited in Reed, 2008, p. 2421). They engaged the public in selecting the most important criteria by prioritizing the list in two participatory workshops (Chase, Decker, & Lauber, 2004, as cited in Reed, 2008, p. 2421). The results showed that people found an influence on final decisions, accurate information, enhancement of communication and fair participation opportunities as the most preferred criteria (Chase, Decker, & Lauber, 2004, p. 635, as cited in Reed, 2008, p. 2421). In another research, Carnes et al. (1998) engaged the public in creating the list and prioritizing effective participation criteria in a project by the U.S. Department of Energy Office of Environmental Management (DOE) (Carnes, Schwietzer, Peelle, Wolfe, & Munro, 1998, as cited in Brown & Wei-Chin, 2013, p. 587). Meaningful application of people's opinion in decision-making and open participation was the most rated criteria of good participation in Chase, Decker, and Lauber (2004) research (Chase, Decker, & Lauber, 2004, p. 635, as cited in Reed, 2008, p. 2421).

Methodology

Evaluation is a logical review of a program's goals, procedure, execution, and outcomes (Rossi & Freeman, 1993, as cited in Nabatchi, 2012, p. 4). In practice, program evaluation is an attempt to assess the effectiveness of the conducted process and resulted in outcomes (Nabatchi, 2012, p. 4; Rowe & Frewer, 2000, as cited in Brown & Wei-Chin, 2013, p. 564). In fact, among the many types of evaluation, Nabatchi (2010) explains that process and outcome evaluations are particularly applicable for public participation evaluations (Nabatchi, 2012, p. 4). However,

many attempts for the evaluation of collaborative decision-making initiatives has not been organized, as a standard procedure, yet (Halvorsen, 2001; Rowe & Frewer, 2004; Chess, 2010, as cited in Brown & Wei-Chin, 2013, p. 563). Several cases and examples of evaluating collaborative decision-making should be conducted to reach to a level that criteria of good participation can be conceptualized confidently (Beierle & Cayford, 2002, as cited in Cunningham & Tiefenbacher, 2008, p. 842; Brown & Wei-Chin, 2013, 564). However, it is evident that the consideration of the quality of participation should be started from the early beginning and maintained throughout the whole process to expect to reach to a good participatory process (Webler, Tuler, & Krueger, 2001, p. 436).

Reviewing previous examples of participation evaluation shows that the proper approach to systematically evaluate good participation is primarily determining the components of an effective participation procedure and consequently frame the evaluating criteria. The current thesis attempts to extract the components of good participation in WPPGIS from the literature on effective participation techniques, inclusive EParticipation[29] and high-quality WebGIS. While, there is no agreed standard definition of good participation and its related approaches (Laurian & Shaw, 2009, p. 294; Lowndes, Stoker, & Pratchett, 1998, as cited in Brown & Wei-Chin, 2013, p. 563), it is challenging to provide an evaluation framework of a good participation process in WPPGIS that can fit to all the situations or practically measurable. To develop a definition of good participation from previous studies, the current research applied the Webler's (2001) Q methodology to integrate previous studies and re-define the good participation (Webler, Tuler, & Kruger, 2001, p. 435; Webler & Tuler, 2006, p. 703; Danielson, Webler, & Tuler, 2009, as cited in Brown & Wei-Chin, 2013, p. 564). All the alternative terms for good participation were included in the data collection phase to avoid missing relevant research. Literature was reviewed, and Q methodology was applied to create discourses on the successful participation (Sieber, 2006; Jankowski & Nyerges, 2003; Webler & Tuler, 2006; Brown & Kytta, 2014; Webler, Tuler, & Krueger, 2001). The aggregated discourses were primarily an instruction on the requirements of successful public participation (Webler, Tuler, & Krueger, 2001, p. 435). There are some

[29] *"the use of information and communication technologies to broaden and deepen participation by enabling citizens to connect with one another and with their elected representatives."* (Macintosh, 2004, as cited in e-participation, 2018).

inconsistencies regarding the principles of good participation because they result from different research philosophies and approaches which Kalof called it *"contradictory readings of phenomena"* (Kalof, 1997, p. 103). The collected and created discourses then were analyzed to create a list of potential criteria of good participation (Webler, Tuler, & Krueger, 2001, p. 435).

Instead of triangulation[30] which if reasonable to implement is a standard methodology for analyzing and interpreting the collected results from different sources, the current research applied qualitative meta-analysis (O'Donoghue & Punch, 2003, p. 78, as cited in Triangulation, 2018). Qualitative meta-analysis is a proper method for this research because it can help to intensely focus on the particular topic of good participation through analyzing a broad, non-related and sometimes contradictory research altogether (Timulak, 2009, p. 591). Schreiber, Crooks, and Stern (1997) defined qualitative meta-analysis as: *"the aggregating of a group of studies for the purposes of discovering the essential elements and translating the results into an end product that transforms the original results into a new conceptualization."* (Schreiber, Crooks, & Stern, 1997, p. 314, as cited in Andrews, Higgins, Waring-Andrews, & Lalor, 2012, p. 13). As a result, this thesis builds its analogy and conclusion based on the secondary qualitative analysis of the previous studies to re-frame and create a list of guiding criteria for good participation in decision-making (Timulak, 2009, p. 591).

There is insufficient information on the definition and unambiguous determination of good and high-quality participation on the available literature (Brown & Wei-Chin, 2017, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 4). As a result, current study aggregates the dispersed data in this topic to interpret them toward forming an evaluative framework (Abelson & Gauvin, 2006, p. 8). Among the participation evaluation research, participation process evaluation is more prevalent (Beierle, 2002; Renn, Webler, & Wiedemann, 1995; Rowe & Frewer, 2000, as cited in Reed, 2008, p. 2421). The current study attempted to expand the evaluation framework to include public participation goals and outcome in the evaluation to make it more general and applicable to diverse scenarios.

[30] *"A method of cross-checking data from multiple sources to search for regularities in the research data."* (O'Donoghue & Punch, 2003, p. 78, as cited in Triangulation, 2018). By increasing the number of resources and methodologies in triangulation, researchers attempt to decrease the biased conclusions that is natural to applying one method with one researcher and based on a single theory (Triangulation, 2018).

Participation in WPPGIS happens online and offline (Tang & Waters, 2005, p. 24, 56). Online and offline participation have some similarities, but their methods and quality criteria are different, as well (Aichholzer & Westholm, p. 15). In a comprehensive evaluation framework of proper participation in WPPGIS, both online and offline requirements and limitations are important to consider (Aichholzer & Westholm, 2009, p. 15).

While several methods might be used in WPPGIS, the evaluation framework needs to be expanded to cover various potential participation methods. As a result, the evaluation framework cannot necessarily be limited to evaluation of online participation methods. However, the aim is to focus on web-based and online participation methods for decision making. This thesis attempts to extract the relevant and applicable evaluation criteria of both online and non-online participation practices, in general.

The main agenda for this research is integrating the diverse results of the previous studies on the good participation quality to create an evaluation framework for WPPGIS. This integration would be similar to Rowe and Frewer's (2000) research on integrating different participation evaluation methods to introduce their effectiveness criteria (Rowe & Frewer, 2000, p. 10). The crafted framework then can be helpful in determining criteria for the evaluation of functional participation in WPPPGIS. One of the weaknesses of the collected literature on participation evaluation is their limitation to theoretical evaluation rather than a practical examination of the effectiveness of the evaluation tools (Rowe & Frewer, 2000, p. 10). However, the research area of public participation enforces the theoretical evaluation, due to its challenging nature of controlling research circumstances and variables (Rowe & Frewer, 2000, p. 11). While there is not any one type of effective public participation method, authorities decide about the proper method by combining the requirements of each situation with its specific "*contextual/environmental"* characteristics (Smith, Nell, Prystupa, 1997, as cited in Rowe & Frewer, 2000, p. 11).

The result of different studies was aggregated to create a list of potential evaluation criteria. The resulted list from literature review can be used as a suggestion for creating evaluation framework (as Baxter and Jack, 2008 contextualized as *"deconstructing"* and *"reconstructing"* of different things) or checklist of the components of a good participation in

any WPPGIS project (Baxter & Jack, 2008, p. 544). Baxter and Jack (2008) recommend such approach of decomposition of the available results to reach to the necessary components for composing a new framework as a proper method for developing information on areas of research that lack sufficient case studies (Baxter & Jack, 2008, p. 544). Taking pieces from different research would increase the validity of the results when there is no accepted standard (Baxter & Jack, 2008, p. 544). Furthermore, accumulating the results of the different research would create a more comprehensive framework, and each research might complement shortages in other research ().This integration is a resolution the current thesis chose to overcome the validity issue when relying on second-hand information (Burton, 2009, p. 271; Baxter & Jack, 2008, p. 549).

This approach has been practiced in other studies as well. For instance, Blahna and Yonts-Shepard (1989) created their list of evaluation criteria by reviewing the literature on quality of public participation (Blahna & Yonts-Shepard, 1989, as cited in Chase, Decker, & Lauber, 2004, p. 630).

Other than building the research argument on the result of other studies and literature review, it was also a standard approach in the 1990s to build the argument around available theories (Chase, Decker, & Lauber, 2004, as cited in Reed, 2008, p. 2421). For instance, Fiorino (1990) used the participation theory to conclude that direct involvement, equal influence over decisions, reliable and effective communication with participants, and trusting the validity of local knowledge along technical information are the primary determinants of a successful participatory decision-making (Fiorino, 1990, as cited in Chase, Decker, & Lauber, 2004, p. 630). Similarly, Laird (1993) used Pluralism and participation theories to bring light to the fact that while the necessary information for decision-making should be created and developed through participation, it is important to discuss about the ownership of the decisions, as well (Laird, 1993, as cited in Chase, Decker, & Lauber, 2004, p. 630). Democratic theory helped Renn, Webler, and Wiedemann (1995) to develop their argument about fairness and competence in good participation (Renn, Webler, & Wiedemann, 1995, as cited in Chase, Decker, & Lauber, 2004, p. 630). In the field of public participation, theories have also been used to develop new terms and definitions. For instance, Webler (1995) started a new topic on the *"right to participate"* by developing the communication theory in public participation field (Webler, 1995, as cited in Chase, Decker, & Lauber, 2004, p. 630).

Chase et al. (2004) developed his research through reviewing the literature and investigating theories to develop a list of criteria that acquired public confirmation, as well (Lauber & Knuth, 1999, as cited in Chase, Decker, & Lauber, 2004, p. 631). WPPGIS design is dependent on public's feedback (Tang & waters, 2005, p. 18). Authorities collect feedback on the effectiveness of the process and use it to improve the design of the rest of the process or future decision-makings (Tang & waters, 2005, p. 32). As a result, each WPPGIS repeats several steps to design and implement good participation (Tang & Waters, 2005, p. 32).

This thesis proposes to frame components of good public participation in WPPGIS. Requirements of good participation should be considered during objective-setting, implementation of the process, and outcome of a web-based collaborative spatial decision-making system (WPPGIS) (Ambrose, 2013, p. 3). Proper designing of a participatory process is essential determining the factor of the success of participatory decision-making (Mattessich et al., 1992; Straus, 1999; Gray et al., 2005, as cited in Schlossberg & Mattia, 2003, p. 9). As a result, the current study illustrates a general participatory process through considering EParticipation process (Diagram 3), PPGIS procedure (Diagram 4), a traditional public participation guideline (Table) and general public participation procedure (Diagram 5). Such hypothetical process would guide tracing good participation throughout the whole project from initiation, planning, implementation, feedback collection and evaluation of a potential WPPGIS project (Ambrose, 2013, p. 3).

This thesis builds its analogy based on previous studies, literature review and available information of exemplified case studies. The optimal goal of the research is helping authorities and participation initiators to design and implement their WPPGIS with the knowledge on which components needs to be considered for design, implementation and evaluation to make it more successful participation (Ambrose, 2013, p. 4). In fact, the current thesis is an attempt to answer the need for a standard that is caused by the gap between theoretical principles and practical recommendations for a successful/proper/good/ public participation (Shipley & Utz, 2012, as cited in Ambrose, 2013, p. 4).

The leading hypothesis structuring this thesis is constructivist paradigm which is based on the fact that *"truth is relative and that is dependent on one's perspective."* (Baxter & Jack,

2008, p. 545). As the result researcher's interpretation and subjectivity is the primary determinant of the suitability of the recommended criteria (Baxter & Jack, 2008, p. 545). However, there is some degree of objectivity by relying on the conclusions of the well-known expertise in the field (Baxter & Jack, 2008, p. 545). Constructivist paradigm is a better fit for this research mainly because the recommendations are based on derived results from other studies which follow different approaches and standards to make them inconsistent and, in some aspect, invalid (Sieber, 2006, p. 494; Kirby, Greaves, & Reid, 2006, as cited in McGee, 2009, p. 45; Burton, 2009, p. 271). As a result, the current research provides a fundamental recommendation for practitioners who want to implement their WPPGIS and set their project-specific and modified version of the evaluation framework. The topic of the good public participation is not a precise and strictly definable field and as a result, the current method which is flexible and can rectify the results' inevitable discrepancy, is a proper method for researching quality of the public participation.

The current framework is a hypothetical (theoretical) evaluation framework. In practice, this means that many of the criteria might not be measurable or applicable in many cases. Also, the proposed framework is a comprehensive framework, which means that not all the criteria must necessarily be included in all the evaluation of WPPGIS projects. As a result, each project should have its set of evaluation criteria which is selected based on the characteristics of that project including participants, context, and primary objectives. Furthermore, the recommended criteria are a list of available research in various technological and socio-political era, which means current progress of the technology, significant advancement of people's skills in online interactions, and what is assumed to be a good web-based participation have changed tremendously, and it makes some of the proposed criteria outdated and non-applicable. However, this thesis is obliged to include most of the available evaluation experiences even though they might not be applicable anymore.

Effectiveness evaluation of both process and outcome are essential (Brown & Wei-Chin, 2013, p. 563). Even though in an investigation of the importance of outcome or process evaluation, Brown and Yeong Wei Chin (2013) found out that the participants put more weight on the importance of outcome evaluation (Brown & Wei-Chin, 2013, p. 563). Process and outcome evaluation follow a similar approach in predefining criteria and quality standards and

then comparing the collected results with those criteria (Aichholzer & Westholm, 2009, p. 11). The set of criteria can be limited or be comprehensive and expand to quality determination details (Aichholzer & Westholm, 2009, p. 11). The primary model and study paradigm is the primary determinant of the selected criteria and framework (Aichholzer & westholm, 2009, p. 11). However, researchers can decide to adopt several models for their evaluation (Aichholzer & Westholm, 2009, p. 11). For instance, Macintosh and Whyte (2008), integrated the theories of deliberative discussions with a goal-based project to structure their evaluation framework (Macintosh & Whyte, 2008, as cited in Aichholzer & Westholm, 2009, p. 11). The current thesis chose the middle ground in integrating different perspectives from academia, authorities, and public and put equal importance on process and outcome evaluation through collecting criteria from various sources in theory and practice to frame the evaluation framework of WPPGIS.

Table 7 Schematic offline public participation procedure (Public participation guide: Planning for participation, 2018)

- **Step 1. Organize a participation proposal**
- Establish objectives
- Plan the activity
- Operate a primary assessment and compose its report
- Review the report
- Make a decision
- Conduct necessary modification actions and audit the result
- Develop a strategy
- Collect preliminary information
- Identify interested parties
- Contact interested parties
- Decide about the desired intensity of participation
- Select participation activities
- Identify timelines
- Allocate financial resources
- Appoint tasks and tasks
- Develop documentation process
- Prepare detailed plans

- Identify the type of activity
- Determine target groups and match the required activities with them
- Present clear and specific information on stakeholders, organizations, interested parties and their relation to the community
- Investigate the possible issues restricting full participation such as spatial accessibility, remoteness, technical illiteracy, and ineffective communication tools
- Clarify expected results of each activity
- Determine the process of applying the achieved results
- Provide details on the length and quantity of each designated activity
- Detail the evaluation procedure
- Determine the contents and steps that are required to be included in the final evaluation
- Pre-set standards and criteria for evaluating the quality of the participation
- Collect the required information for evaluation
- Set the measurement tools for the evaluation

➢ **Step 2. Implement the plan**

- Provide early notice
- Provide information
- Distribute relevant information
- Implement activities
- Capacity-building activities
- Public participation activities
- Keep an on-going communication with participants
- Monitor and adapt activities
- Review and record input
- Participant's input
- Modification of the final participation agenda
- Analyze and incorporate input
- Analyze input
- Provide feedback
- Draft results
- Monitor results

- Provide feedback on the achieved results to participants
- Communicate results broadly

➢ **Step 3. Evaluate the process**

- Evaluate the process
- Report evaluation results
- Inform decision makers
- Disseminate best practices
- Communicate outcomes
- Document lessons learned

Diagram 3 Schematic EParticipation procedure (Scherer & Wimmer, 2012, p. 151)

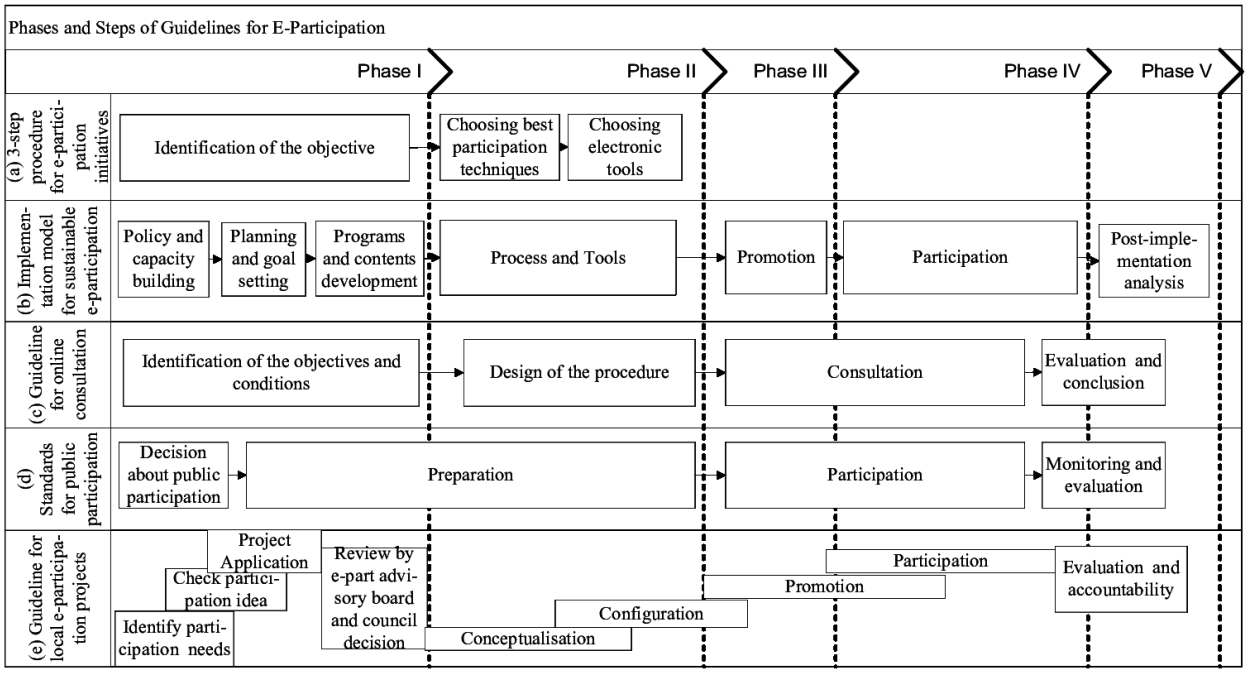


Diagram 4 Flowchart for spatial in-depth Tube well planning with PPGIS techniques (Hassan, 2005, p. 249)

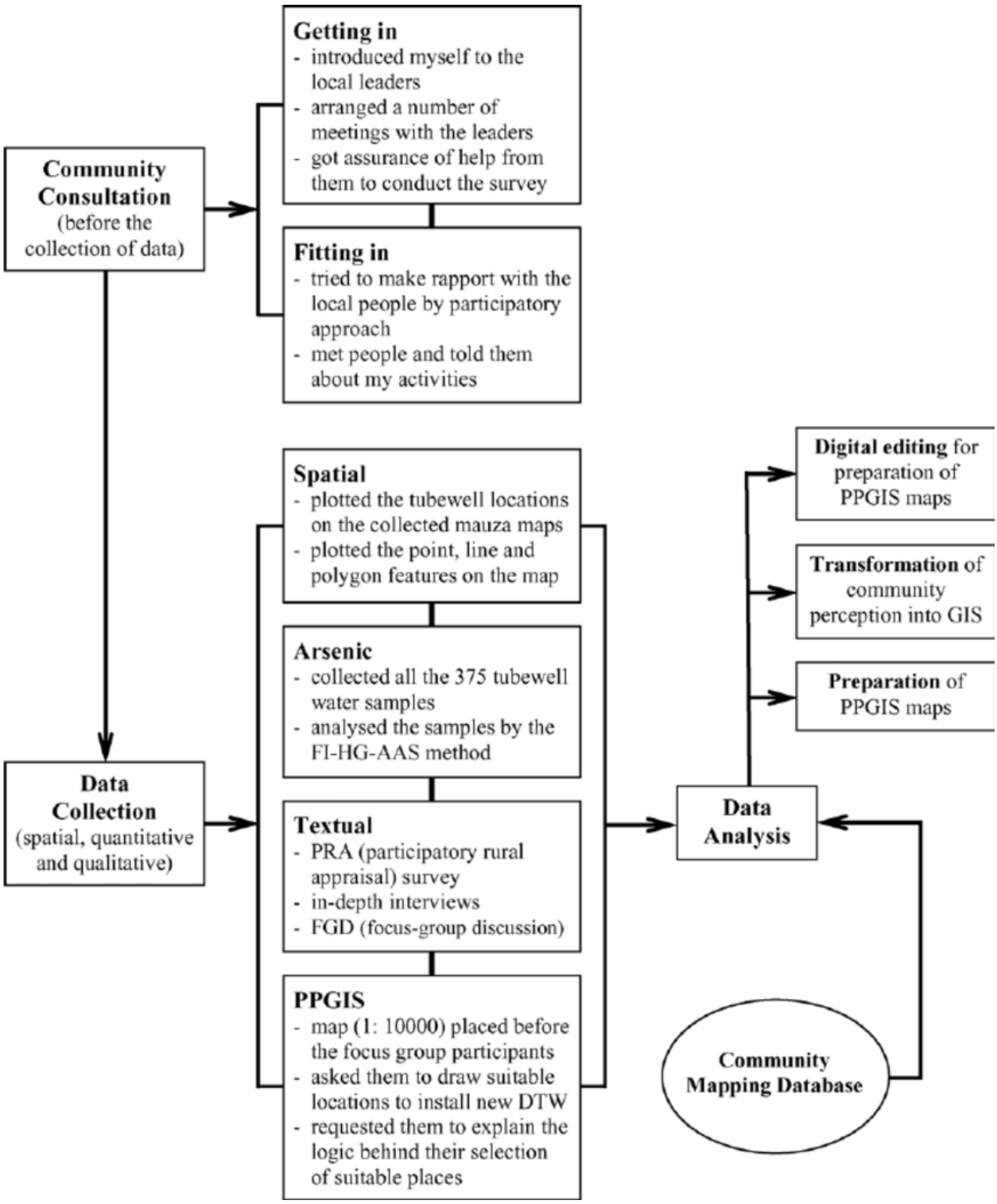
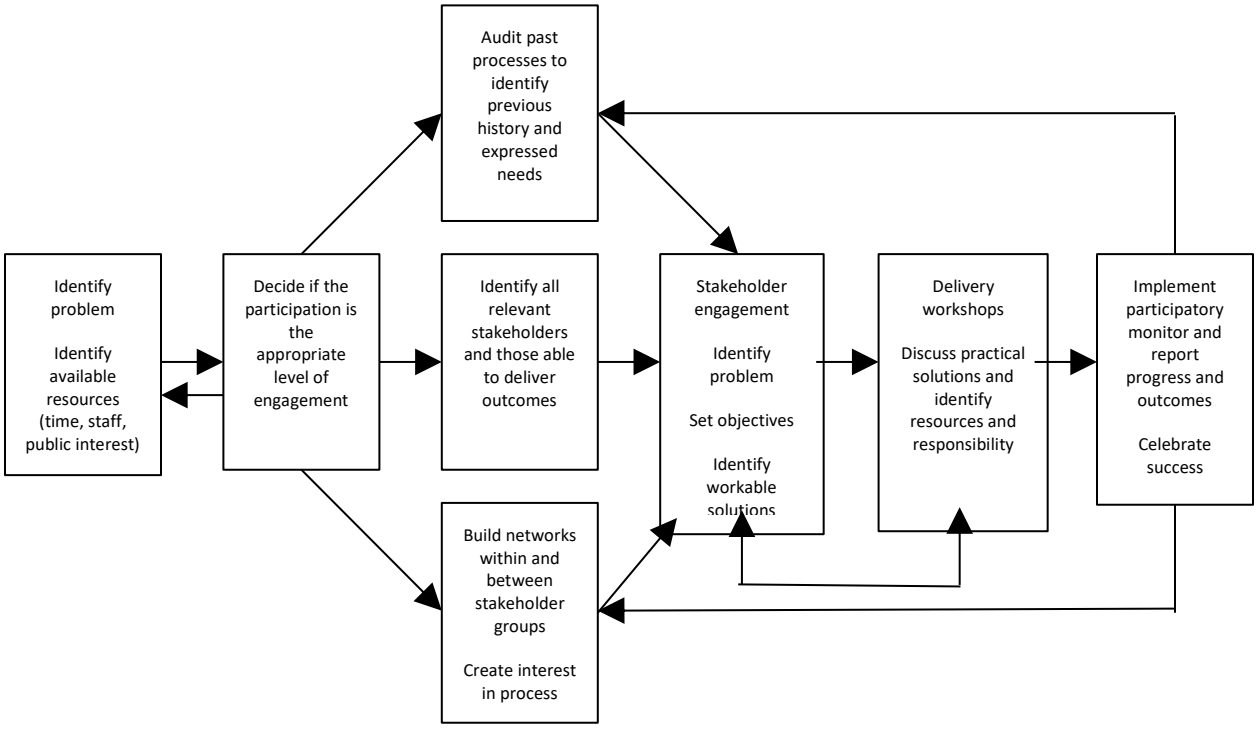


Diagram 5 Participation process (Richards, Blackstock & Carter, 2004, p. 20)



To clarify how resources are going to use in solving participation problems, Richards, Blackstock, and Carter (2004) illustrated the relation between participation process and resources (Richards, Blackstock, & Carter, 2004, p. 20, as cited in Reed, 2008, p. 2421). Beside determining participating stakeholders, Richards (2004), included the monitoring and evaluation as the required steps in the participation process to make participatory decision-making efficient (Richards, Blackstock, & Carter, 2004, p. 20) (Diagram 5).

Diagram 6 WPPGIS procedure and the possibility of evaluating good participation

Offline			Online			
Preparation	Plan	Implement	Preparation	Plan	Data collection	Implementation
Objectives → Process → Outcomes			Objectives → Process → Outcomes			

Good participation framework

The proposed framework is theoretically an integration of public participation and human-computer interactions (HCIs) theories that have significant overlap. This conceptual framework[31] which has considered requirements of good participation can be used as a guideline for designing, implementing, and evaluating WPPGIS (Turkucu, 2008, p. 18; Green, 2014, p. 35). There have not been enough resources to design and advocate a carefully tested and practical framework. As a result, this guideline provides potential criteria that are mainly supported by theory, accepted definitions, researcher's interpretation, and previous studies to consider in designing a WPPGIS that mainly is designed to implement a good participation (Rowe & Frewer, 2000, p. 4; Ambrose, 2013, p. 1).

The success of participatory decision-making is carefully designing a flexible, adaptable and project-specific project (Richards, Blackstock, & Carter, 2004, p. 18). Authorities and participants must start the participation first by agreeing on their intentions and goals for participation, who should be involved, and how the process should be implemented (Richards, Blackstock, & Carter, 2004, p. 5). Negotiating on the evaluation and its design is helpful in improving the whole participation process and its successful delivery (Richards, Blackstock, & Carter, 2004, p. 20). Ideally, participants should be involved in all through the process, evaluation, and monitoring (Richards, Blackstock, & Carter, 2004, p. 20). If people are engaged in the designing of the process when evaluating there would be less conflict in accepting the results (Richards, Blackstock, & Carter, 2004, p. 20).

A successful participatory process happens in the time that most relevant stakeholders can participate in decision-making efficiently and impact decisions meaningfully (Reed, 2008, p. 2422).

[31] *"Theoretical framework should be used when research is underpinned by one theory and that a conceptual framework draws on concepts from various theories and findings to guide research. However, most of the researchers use conceptual framework and theoretical framework interchangeably."* (Green, 2014, p. 35).

Good public participation criteria

Similar to Schlossberg and Mattia (2003), the current research used Straus' (1999) planning phases to categorize applicable criteria for each stage of the participation process. However, assigning certain criterion to specific phase in the planning process, should not limit practitioners to apply it in other stages, as well. Furthermore, the following list of evaluation criteria is extensive and attempts to include most of the provided criteria on the previous studies, regardless of their applicability, replication, and outdatedness.

Table 8 Summary of good participation criteria

Start-up phase	Process design phase	Consensus-building phase	Implementation Phase
Lawful obligation	Clear procedure	Empowering process	Participation alternatives
Legitimacy	Clear tasks	Trust and security	Notifications
Early engagement	Goal clarity	Representativeness	Regulating outputs
Motivations	Accountability	Responsiveness	Loyalty
Inclusiveness	Objective setting	The process	Satisfaction
Diversity	Flexibility	Responsible leadership	Sense of ownership
Barriers	Access to information	Acceptability	Feedback mechanism
Scale	Conflict resolution	Anonymity	Scientific consultation
	Appeal mechanism		Adaptiveness
	Context consideration		Effectiveness
	Interactivity		
	Involvement level		
	Local knowledge		
	Resource provision		
	Accessibility		
	Fairness & equality		
	Open process		
	Usability		
	Universal values		
	Closure date		
	Diverse communication channels		
	Ease of use		

- Lawful obligation (Brenneis, 1990, p. 33): Public participation is a right (Webler, 1995, as cited in Chase, Decker, & Lauber, 2004, p. 630; Schlossberg & Shuford, 2005, p. 20; Brenneis, 1990, p. 33) and should be legalized (BC Ombudsman, 1988; Hammond, 1989; Lucas, 1976; Parenteau, 1988; Smith, 1984; Thompson, 1980, as cited in Brenneis, 1990, p. 33). While

many governors and authorities respect this right, still the decision is by people in power to decide whether they want to provide opportunities for the public to use their right and how much it influence they are allowed to have impacting decisions (Lucas, 1976, as cited in Brenneis, 1990, p. 33). In early days of hot debates on public participation, authorities would use participation as a tool to legitimize their decisions or gain public approval (Wickson, Delgado, & Kjolberg, 2010, p. 758). Legalizing public participation can enhance public's trust to authorities and make the government-initiated participatory decision-making more credible (Brenneis, 1990, p. 34). Only when all different groups of scientists, authorities, the general public, and impacted communities have equal right to participate in decision-making and influence the final decision, good participation has occurred (Lukensmeyer (Hasselblad-Torres, 2006, p. 16).

- Legitimacy (Lukensmeyer & Hasselblad-Torres, 2006, p. 21; McGee, 2009, p. 23; Aichholzer & Westholm, 2009, p. 12; Nabatchi, 2012, p. 8; Carnes, Schweitzer, Peelle, Wolfe, & Munro, 1998, as cited in Cunningham & Tiefenbacher, 2007, p. 847; Webler, Tuler, & Krueger, 2001, p. 441): Occurrence of conflicting opinions in any participatory decision-making is inevitable (Webler, Tuler, & Krueger, 2001, p. 441). However, the primary goal of participatory decision-making is reaching consensus or some degree of compromising (Webler, Tuler, & Krueger, 2001, p. 441; Lukensmeyer & Hasselblad-Torres, 2006, p. 10). Legitimate participation gives equal chances to all the diverse voices of experts and elites to marginalized and illiterates (Webler, Tuler, & Krueger, 2001, p. 444). Such considerations diminish the threat to bold and implement preferences of the people in power rather than a decision about collected perspectives and evidence (Webler, Tuler, & Krueger, 2001, p. 441). In a legitimate process, the outcome is an explicit integration of local and technical knowledge (Webler, Tuler, & Krueger, 2001, p. 441). Providing open, accessible, accurate, and up-to-date information in a legitimate process helps the public to express their opinions as informed and confident (Webler, Tuler, & Krueger, 2001, p. 441). Implementers should be clear and transparent on how they consider legitimacy in their decision-making (Webler, Tuler, & Krueger, 2001, p. 441).
- Early engagement (Blahna & Yonts-Shepard, 1989, and Rowe & Frewer, 2000, p. 13, as cited in Brown & Wei-Chin, 2013, p. 565; Brenneis, 1990, p. 10; Reed, 2008, p. 2422): A good participation starts from the early stages of initiation of the process (Prell et al., 2007, as cited in Reed, 2008, p. 2423) and continues consistently during the implementation to monitoring and evaluation phase (Public participation guide: Introduction to Participation, 2018, Dougill, et al.,

2006, as cited in Reed, 2008, p. 2420). As the result implementers should engage the public as early as possible (Knopp & Caldbeck, 1990; Nelson, 1982; Parenteau, 1988; Praxis, 1988; Smith, 1982; and Stanbury & Fulton, 1988, as cited in Brenneis, 1990, p. 27). One of the advantages of early engagement is fewer conflicts on the procedure which decreases the cost of participation because dramatic changes to the process are less probable (Lukensmeyer & Hasselblad-Torres, 2006, p. 22).

- Transparent process (Lukensmeyer & Hasselblad-Torres, 2006, p. 5; Rowe & Frewer, 2000, p. 15; Lauber, 1999, as cited in Brown & Wei-Chin, 2013, p. 565; Nabatchi, 2012, p. 35; Ramasubramanian & Quinn, 2004, as cited in Rinner & Bird, 2009, p. 590; Turkucu, 2008, p. 32; Jankowski & Nyerges, 2003, p. 14; Webler, Tuler, & Krueger, 2001, p. 436): To increase transparency and responsiveness, authorities should provide full details on how community-related decisions are being made (Rowe & Frewer, 2000, p. 15). Transparency should be about every detailed information on the implementation of participatory decision-making from stakeholder determination to consensus-building and meetings' agenda and minutes (Rowe & Frewer, 2000, p. 15). Unclarity of the process might be a source of misunderstandings and conflicts among participants. Such conflicts not only damage the public's trust to authorities but also decreases the quality of participation and its effectiveness (Brenneis, 1990, p. 34).
- Objective and priority setting (Brenneis, 1990, p. 34; Fraser, 1990, as cited in Brenneis, 1990, p. 17; Reed, 2008, p. 2417): Prior to the execution of a participatory decision-making, implementers should be clear about their objectives, priorities and clarify why public participation is the best way to achieve their project's goals (Brenneis, 1990). However, authorities and implementers then have to acquire public's endorsement on the acceptability of their justification (Fraser, 1990, as cited in Brenneis, 1990, p. 34). The primary determinant of the procedure, stakeholders, and level of participation is the pre-set goals and objectives of the project (Reed, 2008, p. 2424). Level of desired participation, dictates the appropriate method for participation and all of these factors consequently affect the quality and success of the participation (Arnstein, 1969; Biggs, 1989; Pretty, 1995; Richards, Blackstock, & Carter, 2004; Rowe & Frewer, 2000; Tippett, Handley, & Rovetz, 2007, as cited in Reed, 2008, p. 2424).
- Flexible process (Tang, 2006, p. 135; Brenneis, 1990, p. 34): By collecting public's opinion about acceptable actions and outcomes, implementers can design a more flexible participation process. Such flexibility makes the planned level of the participation by authorities

to the desired level of influence of the public, and the result would be a flexible process that satisfies both parties (Thompson, 1980, as cited in Brenneis, 1990, p. 34).

- Broad participation opportunities (Brenneis, 1990, p. 33): Available opportunities for participation should be diversified to encourage participation by broader population (Brenneis, 1990, p. 33). As a result, EPA's recommendation is aiming for more meaningful engagement and expand the opportunities specific to each project (Public participation guide: Introduction to participation, 2018). This recommendation can also be interpreted as the standards and qualities of each participatory project should be decided based on its specific situation (Public participation guide: Introduction to participation, 2018).
- Access to information (Brenneis, 1990, p. 53; Rowe & Frewer, 2000, p. 15, as cited in Brown & Wei-Chin, 2013, p. 565; Webler, Tuler, & Krueger, 2001, p. 439): Accessible information facilitates resolving conflicts and reaching to a mutual understanding on the priorities and limitations of community planning (Rowe & Frewer, 2000, p. 16; Parentau , 1988; Praxis, 1988; Smith, 1984; Stanbury & Fulton, 1988; and Thompson, 1980, as cited in Brenneis, 1990, p. 38). Open, accessible, up-to-date, and relevant information are determinants of effective participation (Brenneis, 1990, p. 91). Also, when the public is engaged in the decision-making, then there is no acceptable excuse to restrict information (BC Ombudsman, 1988, p. 32, as cited in Brenneis, 1990, p. 38). It is crucial to make *"public information public"* (BC Ombudsman, 1988, p. 32, as cited in Brenneis, 1990, p. 38). Authorities should be open about information, and if there are some considerations to protect part of information for privacy or security, the public should be provided full details on the type of information and why they have been restricted (Rowe & Frewer, 2000, p. 15).
- Provide information on available alternatives (Brenneis, 1990, p. 33): Based on existing opportunities and limitations, the public can modify their demands and preferences. Provided clear and relevant information by the authorities, helps the public to compare their preferneces and available alternatives realisitcally. Such comparison helps the public to be able to agree on some solutions that might not have been their primary interests (Lukensmeyer & Hasselblad-Torres, 2006, p. 17).
- Regulating outputs (Warner, 1997, p. 430): Responsive authorities and governors should carefully consider the outcomes of the participation and use them for policy-making (Lukensmeyer et al., 2006, p. 17, 18).

- Conflict resolution mechanisms: Conflict resolution mechanism (Brenneis, 1990, p. 40): A good participatory decision-making designs some mechanisms for proper handling of arising conflicts (Brenneis, 1990, p. 40). Also, traditionally public participation is based on negotiation and mediation (Brenneis, 1990, p. 40). Compared to the time, energy and money that authorities should spend to overcome legal disputes and litigations, it is worthy to carefully design the conflict resolution mechanism from the beginning of the program (Brenneis, 1990, p. 40). People should join the negotiations about conflicting issues voluntarily (Brenneis, 1990, p. 40). A successful conflict resolution mechanism involves all the conflicting and aligned interests to negotiate on resolving the conflict (BC Ombudsman, 1988; and Dunster, 1988, as cited in Brenneis, 1990, p. 40). It is crucial that people have the power to discuss their perspectives and decide about compromising or receiving incentives without any pressure (Brenneis, 1990, p. 40).
- Consensus[32] decision-making (Webler & Tuler, 2000, p. 568; Webler & Tuler, 2006, p. 699; Aichholzer & Westholm, 2009, p. 14; Twight & Carrll, 1983; and Innes & Booher, 1999, as cited in Brown & Wei-Chin, 2013, p. 566; Innes, 1999, p. 57; Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 14; Laurian & Shaw, 2009, p. 297; Lukensmeyer, Goldman, & Stern, 2011, p. 15; Macintosh & Whyte, 2008, p. 24; Tuler & Webler, 1999, p. 444): To reach a consensus all the interests should be expressed and discussed (Dressler, 2006, p. 1, as cited in Engaging with the public, n.d.). During a consensus-building process, after providing equal opportunity to all the interests to be presented, participants reach to a common understanding on what is the problem and who and why oppose or support it (Engaging with the public, n.d.). Further discussions take the participants to the point that they can agree on a solution and commit to implementing the approved decision (Engaging with the public, n.d.). Cooperation in consensus-building enhances participation. Also, the agreed solution can be assumed to be more representative of all opinions (Engaging with the public, n.d.).
- Appeal mechanism (Brenneis, 1990, p. 94; Tang, 2006, p. 136; Macintosh & Whyte, 2008, p. 25; EPA, 2010, p. 20; Aichholzer & Westholm, 2009, p. 15): Similar to the right to participate (Webler, 1995, as cited in Chase, Decker, & Lauber, 2004, p. 630), the public has the right to appeal (Brenneis, 1990, p. 40). Good participatory decision-making should consider appeal mechanism alongside conflict resolution mechanism for the time that opposing opinions

[32] *"A process when all the involved parties agree to accept and implement a solution that benefits all the group members."* (Dressler, 2006, p. 1, as cited in Engaging with the public, n. d.).

cannot reach to consensus (Fraser, 1988 as cited in Brenneis, 1990, p. 40). The appealing mechanism should be explained to the public, and anyone can access it easily (Brenneis, 1990, p. 41).

- Loyalty (Brenneis, 1990, p. 42; Chess & Purcell, 1999, p. 2690): Commitment to the participation process and its outcome is the responsibility of both authorities and the public (Brenneis, 1990, p. 42). Commitment should continue throughout the whole process and after reaching the final decision, as well (Brenneis, 1990, p. 42). Commitment can affect the quality of decision-making process, because when people oblige themselves voluntarily to follow the guidelines, allow others to express their opinions, and respect the final decision which has been resulted from consensus and accept opposing views while it might be against their will, the participation process has reached to its ideal quality (Fraser, 1990; Knopp & Caldbeck, 1990; Niezen, 1987; Parenteau, 1988; Praxis, 1988; Sadler, 1980; Stanbury & Fulton, 1988, as cited in Brenneis, 1990, p. 42). Volunteer commitment is more probable when the community development and decision-making process has been initiated by the public and not dictated by legal requirements (Lukensmeyer, Goldman, & Stern, 2011, p. 40). While authorities and implementers of decision-making processes are the primary determinants of the level of engagement, they also can *"decide about the role they want the public play"* in decision-making and how much of commitment and influence is welcomed (Emmerson interview[33], 2005, as cited in Lukensmeyer & Hasselblad-Torres, 2006, p. 15).
- Adequate consideration of the context (Richards, Blackstock, & Carter, 2004, p. 19): Any participatory decision-makinjhg project that is initiated for resolving a community's problem needs to consider appropriation of its procedure and context with socio-cultural, political, and economic requirements of that community (Aichholzer & Westholm, 2009, p. 15; Richards, Blackstock, & Carter, 2004, p. 21).
- Simple and general technical skills (Aichholzer & Westholm, 2009, p. 13; Haklay & Tobon, 2003, p. 577; Macintosh & Whyte, 2008, p. 24; Sidlar & Rinner, 2007, as cited in Rinner & Bird, 2009, p. 588; Steinman, Krek, & Blaschke, 2004, p. 4, as cited in Rinner & Bird, 2009): Participants in an online decsion-making system have different computer skills and knowledge to efficiently involve in the decsion-making process (Bugs, Granell, Fonts, Huerta, & Painho, 2010,

[33] Has not been clearly referenced in the original article.

p. 177). As a result, the program should be designed simple, comprehensible and flexible to be usable by broader population (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 176).

- Satisfaction (Aichholzer & Westholm, 2009, p. 12): Satisfaction with the system should be measured through open discussions and opportunity for commenting on the usefulness of the system for encouraging participants to involve in the decision-making process (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 176).
- Interactivity (Macintosh & Whyte, 2008, p. 18; Mossberger & Jimenez, 2009, p. 3; Steinman, Krek, & Blaschke, 2004, as cited in Rinner & Bird, 2009, p. 9; Sadagopan, 2000, p. 26; Steinmann, Krek, & Blaschke, 2004, p. 2; Kingston, Carver, Evans, & Turton, 1999; and Chua, 2002, as cited in Steinman, Krek, & Blaschke, 2004, p. 2; Tripp, 2007, p. 22; Evans-Cowley & Hollander, 2010, as cited in Twitchen & Adams, 2011, p. 12; Kingston, 2002, as cited in Weiner, Harris, & Craig, 2002, p. 6; Sidlar & Rinner, 2007, as cited in Zhao, 2007, p. 32): *"Interactivity implies enabling users to have high communication levels with the system"* (Steinman, Krek, & Blaschke, 2004, as cited in Bugs, Granell, Fonts, Huerta, & Painho, p. 175). Online participation implementers should provide a dynamic and interactive environment that promotes active engagement in discussions. Such interactive environments could be promoted in online discussion forums and virtual meetings. An interactive communication channel such as online forum improves the quality of participation by enhancing communication from a one-way to two-way interaction that is deliberative, open, empowering and accessible (Steinman, Krek, & Blaschke, 2004; Tang, Zhao, & Coleman, 2005, as cited in Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 175). *"Easy discussion"* provides equal opportunity for all the voices to be heard and prepares the stakeholders to reach consensus (Bugs, Granell, Fonts, Huerta, & Painho, p. 179).
- Empowering process (Weiner, Harris, & Craig, 2002, p. 13; Blackstock, Kelly, & Horsey, 2007, p. 731; Brown & Wei-Chin, 2013, p. 578; Reed, 2008, p. 2422; Wiedemann & Femers, 1993, p. 364): Through participation people mutually learn new skills (Wiedemann & Femers, 1993, p. 363; Webler & Tuler, 2006, p. 707; Laurian & Shaw, 2009, p. 297). Participation increases the sense of community and ownership of the project between participants and by volunteering and devoting their time and energy, participants learn to compromise their preferences and interests (Brechin et al., 1991; and Innes, 1996, as cited in Brody, 2003, p. 409). Empowering process is measured based on the criteria of power to influence decisions (Fiorino,

1990; Laird, 1993; Chase, Decker, & Lauber, 2004; and Tippett, Handley, & Ravetz, 2007, as cited in Reed, 2008, p. 2422; Brenneis, 1990, p. 31; Rowe & Frewer, 2000, p. 14; Chase, Decker, & Lauber, 2004, p. 635, as cited in Reed, 2008, p. 2421) and effective participation in decision-making (Richards, Blackstock, & Carter, 2004, as cited in Reed, 2008, p. 2422).

- Agreed objectives (Richards, Blackstock, Carter, 2004, p. 21; Warner, 1997, p. 421; Reed, 2008, p. 2424): Participatory decision-making is structured based on the values, interests, preferences, and restrictions of each community (Tang, 2006, p. 1). However, still community members require opportunities to express their preferences and discuss alternative options to mutually reach to an acceptable standard interest in that community (Tang, 2006, p. 1). When people are engaged early in the process, they would have the chance to discuss their perspectives on the goals and objectives (Tang, 2006, p. 11). Agreeing on the objectives of the participation process is an essential factor determining the quality and success of participatory decision-making (Tang, 2006, p. 11)
- Learning effects over the participation process (Tang, 2006, p. 21; Laurian & Shaw, 2008, as cited in Ambrose, 2013, p. 1; Laurian & Shaw, 2009, p. 297; Friedmann, 1973, as cited in Brown & Kytta, 2014, p. 134): Public participation is a continuous mutual learning process (Chase, Decker, & Lauber, 2004; Johnson, Lilja, Ashby, & Garcia, 2004; Lynam, de Jong, Sheil, Kusumanto, & Evans, 2007, as cited in Reed, 2008, p. 2422). In such *mutual learning* environment, people with diverse interests and opinions become the source of knowledge and skills to teach to each other (Reed, 2008, p. 2420). Also, authorities and participants acquire valuable information from each other, through *"co-learning"* (Lynam, de Jong, Sheil, Kusumanto, & Evans, 2007, as cited in Reed, 2008, p. 2420) and *"social learning"* (Blackstock, Kelly, & Horsey, 2007, as cited in Reed, 2008, p. 2420), as well.
- Proper level of involvement (Richards, Blackstock, & Carter, 2004; Tippett, Handley, & Ravetz, 2007, as cited in Reed, 2008, p. 2419; Aichholzer & Westholm, 2009, p. 14; Arnstein, 1969, as cited in Ambrose, 2013, p. 6; OECD, 2004, p. 11, as cited in Blackstock, Kelly, & Horsey, 2007, p. 728; Beierle & Konisky, 2001, as cited in Blackstock, Kelly, & Horsey, 2007, p. 728; Brody, 2003, as cited in Brabham, 2009, p. 245; Maier, 2001, as cited in Brabham, 2009, p. 254; McAllister, 1986, as cited in Brenneis, 1990, p. 19; Alterman, Harris, & Hill, 1984; Brody, 2001, as cited in Brody, 2003, p. 410; Brown, 2015; Brown & Wei-Chin, 2013, p. 573): Good participation happens when people have the power to influence the final decision (Public

participation guide: Introduction to public participation, 2018). If authorities are only looking for public legitimacy and want to gain credit for their preferred decisions, the process is not participatory (Moffet, 1996, as cited in Rowe & Frewer, 2000, p. 5; Rowe & Frewer, 2000, p. 14). However, based on the objectives of the participation and desired level of engagement (Arnstein, 1969, as cited in Rowe & Frewer, 2000) by authorities, implementers can decide what the proper level of engagement for their project (Rowe & Frewer, 2000, p. 6) is.

- Trust and security (Aichholzer & Westholm, 2009, p. 15; Macintosh & Whyte, 2008, p. 25): A participatory decision-making is successful when people trust authorities that their opinions are going to influence the final decisions for real (Tang & Waters, 2005, p. 56). Any reason that weakens this trust can impact the success of the whole project (Tang & Waters, 2005, p. 56). However, in online interactions building a trusting relationship between participants and implementers is challenging (Kingston, Carver, Evans, & Turton, 2000, as cited in Tang & Waters, 2005, p. 56). Lack of face-to-face interactions and visible changes resulted from participants involvement, makes encouraging the public to engage in participatory decision-making difficult (Chua & Wong, 2002, as cited in Tang & Waters, 2005, p. 56).
- Participants are informed and consulted for the upcoming events (Brenneis, 1990, p. 33; Aichholzer & Westholm, 2009, p. 2; Drew, 2003, p. 75; Webler & Tuler, 2006, p. 706): Being open about community's problems and opportunities to involve in decision-making is part of the responsibility of authorities, even though the authorities and the public are equal in their rights and responsibilities for decision-making (Liu, 2007, p. 93). The informed public then can initiate better participatory decisions (Aichholzer & Westholm, 2009, p. 12; Brenneis, 1990, p. 10).
- Motivations for participation: Participation in community planning is derived from the value system of the participants. As the result stronger sense of community and more informed community members motivates more involvement in decision-making. Also, when people are motivated based on their value system, they are ready to compromise their preferences for the best of the community (Webler, Tuler, & Krueger, 2001, p. 436). By providing an environment that is respectful of all the opinions, and responsible authorities, the public is encouraged to participate in decision-making (Webler, Tuler, & Krueger, 2001, p. 443).
- Outreach and promotion planning: Designing a full public relation and outreach program is an essential part of a good participation process (O'Connor, Schwartz, Schaad, & Boyd, 2000, p. 7). Planning for connecting to people, publicizing information, noticing public gatherings,

collecting stakeholders' opinions, and publishing final results are examples of outreach planning (Webler, Tuler, & Krueger, 2001, p. 444). However, to design an effective outreach program, planners should first determine stakeholders and their characteristics to select proper communication tools and approaches.

- Increase public awareness (Laurian & Shaw, 2009, p. 297): Providing detailed information about all the conflicting opinions, problematic interests, and concerns of other community members, helps participant to fully comprehend the project and authorities' chosen approach to deal with those issues (Webler, Tuler, & Krueger, 2001, p. 444). Gaining such understanding in participants is necessary because it would facilitate consensus-building.
- Clear guidelines on tasks and procedures (Lukensmeyer & Hasselblad-Torres, 2006, p. 15; Creighton, 2005, p. 75): A good public participation has a clear mandate on each stage and details of the process from its initiation to choice of methods, stakeholders' selection, collecting information, methods of participation, tools and techniques for disseminating information, level of government control, and clarifying the level of potential impact on the final decisions (Lukensmeyer & Hasselblad-Torres, 2006, p. 18).
- Fair representation of people and interests (Rowe & Frewer, 2000, p. 12; Webler & Tuler, 2000, p. 571; Aichholzer & Westholm, 2009, p. 14; Crosby, Kelly, & Schaefer, 1986; Blahna & Yonts-Shepard, 1989; Petts, 1995; Carnes, Schweitzer, Peele, Wolfe, & Munro, 1998; Lauber, 1999; as cited in Brown & Wei-Chin, 2013, p. 565; Webler, 1995, as cited in Chess & Purcell, 1999, p. 2686; Habermas, 1987, as cited in Reed, 2008, p. 2419; Macintosh & Whyte, 2009, p. 24): As much as the diversity of affected people increases in any participatory decision-making, implementers should be cautious on marginalizing or excluding a particular interest or group specially the ones with lower power for influencing decisions (Rahl, 1996, as cited in Rowe & Frewer, 2000, p. 13; Vaughan, 1993, as cited in Rowe & Frewer, 2000, p. 12). It is more probable that the dominant participants are comprised of unrepresentative educated people who are eager to participate and exclude the least-able minorities unintentionally (Freudenberg & Olsen, 1983, as cited in Rowe & Frewer, 2000, p. 12). Also, represented views should be distributed logically as well. If in a small population, every perspective is included, the result would be a dispersed and not focused collection of opinions that has missed the consideration of the views that are expressed by the majority of the group (Rahl, 1996, as cited in Rowe &

Frewer, 2000, p. 13). Fairness and balance in representing diverse opinions are principal in a good participatory process (Webler, Tuler, & Krueger, 2001, p. 446).

- Fairness[34] and equality (Bleiker & Bleiker, 1995, as cited in Webler, Tuler, & Krueger, 2000, p. 443; Renn, Webler, & Wiedemann, 1995, as cited in Webler & Tuler, 2000, p. 567; Westholm & Aichholzer, 2009, p. 14; Bierle, 2002, p. 740; Brown & Wei-Chin, 2013, p. 575): A good participatory decision-making should aim to provide equal opportunity to all the diverse people and threat them fairly (Webler, Tuler, & Krueger, 2000, p. 443). By respecting all opinions, dealing with opposing views neutrally, and developing a trusting relationship with participants, authorities can enhance the quality of the decision-making significantly (Webler, Tuler, & Krueger, 2000, p. 443). Instead of focusing on increasing the number of participants to prove the inclusiveness of the process, implementers should instead increase the quality of interactions with the limited but diverse participants (Bleiker & Bleiker, 1995, p. III-8, as cited in Webler, Tuler, & Krueger, 2000, p. 443). A fair and participatory process provides equal opportunity to all the voices to *"be heard*[35]*"* (Webler, Tuler, & Krueger, 2000, p. 443).
- Inclusiveness (Schlossberg & Mattia, 2003, p. 4; Aichholzer & Westholm, 2009, p. 4; Bellamy, 2004, as cited in Blackstock, Kelly, & Horsey, 2007, p. 729; Brown & Wei-Chin, 2013, p. 586; Woolcock & Brown, 2005, as cited in McGee, 2009, p. 24; Laurian & Shaw, 2009, p. 297; Jankowski & Nyerges, 2003, p. 14; Hartz-Karp & Sullivan, 2014, p. 1; Halvorsen, 2001, p. 179; Baker, Coaffee, & Sherriff, 2007; Brownhill & Carpenter, 2007, as cited in Evans-Cowley & Hollander, 2010, p. 406; The City of Edmonton, 2017, p. 13; Kahila-Tani, Broberg, & Kytta, 2015, as cited in Czepkiewicz, Jankowski, Mlodkowski, 2017, p. 553): In the guideleine of the Open City, initiated by The City of Edmonton, inclusiveness has been considered as an essential criteria to have an effective participatory decision-making (The City of Edmonton, 2017, p. 13): Inclusiveness is considering all the diverse groups and interests in the decision-making process (Lukensmeyer, Goldman, & Stern, 2011, p. 62). Besides the determination of all the stakeholders including affected groups and ordinary citizens who might be self-selected or selected by the

[34] "*If the public perceives the decision-making process of a project to be 'fair,' it is willing to live with a project that impacts different interests un-equally"* (Bleiker and Bleiker 1995; p. III-7, as cited in Webler, Tuler, & Krueger, 2001, p. 443).

[35] *"They [the publics] must feel that their concerns, as well as the concerns of others, were taken into account— that they were listened to and heard"* (Bleiker and Bleiker 1995, p. III-8, as cited in Webler, Tuler, & Krueger, 2001, p. 443).

authorities, implementers should carefully investigate the characteristics of the target population to screen whether there is any potentially marginalized group such as First Nations, LGBTQs, and homeless people. Particular attention and probably methods should be used to engage those specific groups in the decision-making, as well (van Dijk & van Deursen, 2014, p. 148; Richards, Blackstock, & Carter, 2004, p. 13; Renn, Webler, & Wiedemann, 1995, p. 169).

- Demographic diversity of users (Lukensmeyer, Goldman, & Stern, 2011, p. 62): Power imbalance that is caused by differences in socio-demographic characteristics of the participants might be a source of marginalization or unequal opportunities for participation (Habermas, 1987; Kothari, 2001; Nelson & Wright, 1995; Cooke, 2001, p. 19, as cited in Reed, 2008). To overcome this obstacle, implementers should carefully distribute diverse characteristics within their selected population to ensure that the represented group has proper and balanced diversity (Lukensmeyer, Goldman, & Stern, 2011, p. 15).
- Citizens' knowledge about opportunities for participation with proper and adequate notifications (Brenneis, 1990, p. 37; Craig, Harris, & Weiner, as cited in Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 17): Adequate notifications should be disseminated through proper channels to make the stakeholders aware of the available opportunities to engage in a decision-making process that they might have a stake in it (Brenneis, 1990, p. 37). Timely, adequate, and proper notification of available opportunities is vital for inclusive participation (Brenneis, 1990, p. 15).
- Resource provision, allocation, efficiency, and maintenance (Abelson & Gauvin, 2006, p. 32; Lukensmeyer, Goldman, & Stern, 2011, p. 63; Rowe & Frewer, 2000, p. 15; Drew, 2003, p. 74; Lukensmeyer & Hasselblad-Torres, 2006, p. 27): Public participation requires different resources that are not necessarily distributed equally among diverse stakeholders (Openshaw, 1991, as cited in Turkucu, 2008, p. 13; Ramasubramanian, 2008, p. 41; van Dijk & Hacker, 2003, p. 323, 324; DiMaggio & Hargittai, 2001, p. 7). Financial resources, technical assistance, open and accessible information, and supporting policies for public engagement are necessary resources for good participation (Land Conservation and Development Commission, 1975, as cited in Lynn & Kartez, 1995, p. 92).
- Accountability and transparency on how decisions are taken (Webler & Tuler, 2000, p. 583; Warner, 1997, p. 430; Carver et al., 2001, as cited in Tang, 2006, p. 133; Stirling, 2008, p. 269; Ramasubramanian & Quinn, 2004, as cited in Rinner & Bird, 2009, p. 590; Lynn & Kartez,

1995, p. 90; Nabatchi, 2012, p. 14; McGee, 2009, p. 25): Participants should have a clear and detailed information about the procedure of decision-making (Kahila-Tani, Broberg, Kytta, & Tyger, 2016, p. 199). Clarity and transparency of implementers in this regard improve trust among participants and consequently result in a good Participation (Creighton, 2005, p. 217). In a study by Kahila-Tani, Broberg, Kytta, and Tyger (2016) evaluating quality of participation, participants were asked about to weight different criteria and the results showed that transparency of implementers and the process and also accountability are the most important criteria determining good participation (Kahila-Tani, Broberg, Kytta, & Tyger, 2016, p. 199). All the involved parties in participatory decision-making should have clear responsibilities. These responsibilities can be negotiated to determine the limits and duties of each participant clearly, and it would help to set measures for the fulfillment of those responsibilities (Sarvasova, Dobsinska, & Salka, 2014, p. 419). When participant accepts to take a role in the process accomplish the agreed responsibilities, they can commit to the success of the process, as well (Macintosh & Whyte, 2008, p. 20).

- Volunteer responsibility (Brenneis, 1990, p. 33; Roberts, 2004, p. 329; Ramasubramanian, 2008, p. 128; Mossberger & Jimenez, 2009, p. 10; Jackson, 2001, p. 144; Brown, 2015, p. 202): Power relation in a participatory decision-making is not fixed and can change toward participants or authorities (Aggens, 1983; Mitchell, Agle, & Wood, 1997, as cited in Schlossberg & Shuford, 2005, p. 19). During the process whichever that gains the power to direct the process, influence decisions, or recommends an alternative should commit to the process and voluntarily take responsibility to execute all the agreed decisions, as necessary (Brenneis, 1990, p. 85). *"Democratic accountability"* or volunteer responsibility taking is part of a good participatory process that all the involved parties are ready to further commit themselves to the interests of the community (Brenneis, 1990, p. 85). Volunteer responsibility is an opportunity for further engagement of the public and impacts the quality of the decision-making significantly (Weber, Tuler, & Krueger, 2001, p. 444).
- The process should foster responsible leadership (Weber, Tuler, & Krueger, 2001, p. 444; Webler & Tuler, 2006, p. 706; Roberts, 2004, p. 337; Richards, Blackstock, & Carter, 2004, p. 21; Ho, 2002, p. 437; City of Edmonton, 2017, p. 23; Brabham, 2009, p. 247; Asthana, Richardson, & Halliday, 2002; Brinkerhoff, 2002; Laverack, 2001; O'Meara, Chesters, & Han, 2004, as cited in Blackstock, Kelly & Horsey, 2007, p. 730): In reality reaching to an ideal

situation that a process is inclusive and includes all the diverse interests in the decision-making process and at the end reaches to consensus is very rare (Weber, Tuler, & Krueger, 2001, p. 444). As a result, one group which mostly is authorities or implementers take the final decisions. However, considering all the diverse interests and preferences while taking the final decision is the middle approach for this problem. Taking the responsibility and leadership role by authorities in the community planning that is planned to be inclusive, fair, and informed is crucial for the success of participatory decision-making (Weber, Tuler, & Krueger, 2001, p. 444).

- The openness of participation process (Wiedemann & Femers, 1993, p. 364; Webler & Tuler, 2006, p. 706): There are several instances where openness in the process of proper participatory decision-making might not be feasibly implementable. For instance, practically planning a process that is entirely open to participation and involving all the participants in the process of technical information collection might not be easy to accomplish (Webler, Tuler, & Krueger, 2001, p. 444).
- Identification of participation barriers (Blackburn & Read, 2005, as cited in Hardiker & Grant, 2011, p. 7): While some of the barriers and limitations to participation are similar for online and offline participation, some of the restrictions and challenges are specific to the nature of online participation such as limitations in accessing to technology, comprehension and language constraints, geographical remoteness causing limited access to technology and Internet, and inadequate knowledge and skills of the users in using technology (Aichholzer & Westholm, 2009, p. 15). Furthermore, some general barriers to participation such as local, cultural, political and economic structures still can impact online participation quality, as well (Aichholzer & Westholm, 2009, p. 15).
- Usability (Haklay & Tobon, 2003, as cited in Twitchen, 2011, p. 6; Zhao, 2007, p. 31; van Dijk & van Deursen, 2014; Tripp, 2007, p. 110; Steinmann, Krek, & Blaschke, 2004, p. 4; Rowe & Frewer, 2004, p. 546; Sidlar & Rinner, 2007, as cited in Rinner & Bird, 2009, p. 588; Mossberger & Jimenez, 2009, p. 27; Macintosh & Whyte, 2008, p. 24; Kingston, 2002, p. 10; Gottwald, Laatikainen, & Kytta, 2016; and Halvorsen, 2001, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, & Wojcicki, 2017, p. 19; Hardiker & Grant, 2011, p. 8; Haklay & Tobon, 2003, p. 577; Carver, Evans, Kingston, & Turton, 2001, p. 913; Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 176; Brabham, 2009, p. 256; Aichholzer & Westholm, 2009, p. 13): In online participation, the design of the website is an essential determining factor of whether it

is usable by participants or not (Zhao, 2007, p. 31). Human-Computer Interface (HCI) provides a standard guideline on how to design a usable website (Haklay & Tobon, 2003, as cited in Tang & Waters, 2005, p. 56). Human and computer interactions can be assessed based on users, experts, and theoretical perspectives (Sweeney, Maguire, & Shackel, 1993, as cited in Zhao, 2007, p. 62). However, most of the studies on HCIs assessment are either based on theory or technical aspects of usability (Craig, Harris, & Weiner, 2002; Steinmann, Krek, & Blaschke, 2004, as cited in Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 176). For instance, in the evaluation of 12 case studies of online participation usability, Steinmann, Krek, and Blaschke (2004) only applied the criteria of technical usability and expert analysis (Steinman et al., 2004, as cited in Zhao, 2007, p. 32). Integrating the three perspectives of usability would help online participation implementers and website designers to develop more effective and high-quality participatory system (Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 176).

It is common that in a diverse group of participants, computer skills and knowledge is not equal and design and development of online participatory systems need to address such unequal capabilities (Tang & Waters, 2005, p. 56). Implementers and web designers should cooperate to develop a participatory system based on existing skill levels, target groups, objectives of participation, and available community resources (Tang & Waters, 2005, p. 56). In Tang and Waters's (2005) observation of a WPPGIS usability, flexibility and user-friendliness of the interface of a WPPGIS are determining and essential factors to increase the quality of participation by considering low level of technical skills which makes the system as inclusive as possible (Tang & Waters, 2005, p. 56).

- Power to influence decisions (Leminsky, 1977, p. 284, as cited in Renn, Webler, & Wiedemann, 1995, p. 18; Webler, Tuler, & Krueger, 2001, p. 439; Wiedemann & Femers, 1993, p. 364; Webler & Tuler, 2006, p. 718; Webler & Tuler, 2000, p. 576; Schlossberg & Shuford, 2003, as cited in Turkucu, 2008, p. 63; Arnstein, 1969, as cited in Tang, 2006, p. 16; Sieber, 2006, p. 495; Tuler & Webler, 1999, as cited in Shipley & Utz, 2012, p. 24; Rowe & Frewer, 2000, p. 19; Goetz & Gaventa, 2001, as cited in Richards, Blackstock, & Carter, 2004, p. 9; Fiorino, 1990; Laird, 1993; Chase, Decker, & Lauber, 2004; and Tippett, Handley, & Ravetz, 2007, as cited in Reed, 2008, p. 2422; Roberts, 2008, as cited in Nabatchi, 2012, p. 4; IAP2, 2007, as cited in McGee, 2009, p. 9; Macintosh & Whyte, 2008, p. 20; Creighton, 2005, p. 116; Burton, 2009, p. 270; Petts, 1995; Carnes, Schweitzer, Peele, wolfe, & Munro, 1998; Lauber,

1999; Rowe & Frewer, 2000, p. 14; and Butterfoss, 2006, as cited in Brown & Wei-Chin, 2013, p. 565; Brenneis, 1990, p. 31; Aichholzer & Westholm, 2009, p. 15): The power relationship is an essential factor of any participatory decision-making (Webler, Tuler, & Krueger, 2001, p. 444). From the very first categorization of methods of participation by Arnstein (1969) who applied power as the differentiator of methods and types of participation, many participatory decision-making projects consider issues, functions, and relations based on power dynamics of the group (Schlossberg & Shuford, 2005, p. 16). Balanced and equal power relationship creates a fair treatment of participants and gives them equal opportunity to express their opinions (Webler, Tuler, & Krueger, 2001, p. 446). In such fair environment, decisions are taken based on expressed opinions and acquired evidence rather than enforced by desires of the people in power (Webler, Tuler, & Krueger, 2001, p. 444).

Collaborating in decision-making or giving the power to influence decisions primarily requires capacity-building (Webler, Tuler, & Krueger, 2001, p. 444). Equal power would promote good participatory decision-making that everyone can discuss their preferences and be sure that decisions are made based on consensus rather than power status (Webler, Tuler, & Krueger, 2001, p. 444).

- Integration of participatory decisions into policy process (Crosby, Kelly, & Schaefer, 1986; Fiorino, 1990; Wiedemann & Femers, 1993; Smith, Nell, & Prystupa, 1997; and Ng & Hamby, 1997, as cited in Rowe & Frewer, 2000, p. 14; Webler, Tuler, & Krueger, 2001, p. 448; Webler & Tuler, 2006, p. 707; Warner, 1997, p. 418): The primary motivation behind participation, most of the time is the fact that participants want to impact policies, or their comments being considered prior to decision-making (Rowe & Frewer, 2000, p. 14). Based on the shared experience of participation, most of the time people can not trust authorities in genuinely looking for their opinion in issues (Rowe & Frewer, 2000, p. 14). Instead the strong assumption is that authorities misuse the participation to legitimize their decisions and this makes people perceive participation to be ineffective (Rowe & Frewer, 2000, p. 14). Discussing how public's opinion is going to impact policies and whether decision-makers include the collected results in the final decisions is an essential determinant of the success of participatory decision-making (Rowe & Frewer, 2000, p. 15).
- Promote a search for universal values (Webler, Tuler, & Krueger, 2001, p. 442): The dynamic of the participation determines the acceptability of methods and behaviors in decision-

making (Webler, Tuler, & Krueger, 2001, p. 443). Lack of a universal value or sympathy with other stakeholders impacts the quality of active participation because of the lack of motivation to reach to a consensus or resolve an issue (Webler, Tuler, & Krueger, 2001, p. 443). The primary attempt of participatory decision-making initiators should be distinguishing and promoting universal values and shared priorities among participants (Lukensmeyer & Hasselblad-Torres, 2006, p. 10). Finding universal values and agreed on parts of an issue is an approach for arising conflicts, as well (McCall, 2003, p. 552; Brenneis, 1990, p. 54).

- Final closure date (Webler, Tuler, & Krueger, 2001, p. 443): Agreeing on a closure date to a decision-making process ensures that implementers would plan for providing feedback to participants and commit themselves to evaluate the process (Webler, Tuler, & Krueger, 2001, p. 444). Furthermore, when the project is formally finished and delivered, authorities get committed to executing the resulted decisions (Webler, Tuler, & Krueger, 2001, p. 444).
- Facilitate communication over diverse channels (Aichholzer & Westholm, 2009, p. 1; Ramasubramanian, 2008, p. 101; Renn, Webler, & Wiedemann, 1995, p. 74; Tang, 2006, p. ii, 3; Tang & Liu, 2016, p. 1074): Providing suitable communication tools and channels for diverse participants increases the quality of participation by enhancing fairness and inclusivity of the process (Lukensmeyer, Goldman, Stern, 2011, p. 15). Also, for online participation, authorities should look for tools and facilities that improves and enhances access to information and participation tools (Aichholzer & Westholm, 2009, p. 12; Brown & Kytta, 2014, p. 126; Clark, 2014; and Connors, Lei, & Kelly, 2012, as cited in Tang & Liu, 2016, p. 1074).
- Coordination of online and offline processes (Aichholzer & Westholm, 2009, p. 11): It is recommended to integrate online and offline participation methods to enhance the quality of participation. In fact, online and offline participation complement eachother (Aichholzer & Westholm, 2009, p. 11). However, methods of participation and channels of communication are different for these two types of participation. Implementers should ensure that the selected methods are complementary rather than competing to each other (Lukensmeyer & Hasselblad-Torres, 2006, p. 34; Stern, Gudes, & Svoray, 2009, p. 1067; Jankowski, Czepkiewicz, Mlodkowski, Zwolinski, Wojcicki, 2017, p. 16). The objectives of each participatory methods should be clear for the evaluation of quality and effectiveness (Reed, 2008, p. 2424; Rowe, Marsh, & Frewer, 2004, p. 106; Richards, Blackstock, & Carter, 2004, p. 15). In cases of using

both online and offline participation, timing is essential and whether both methods are available for participation concurrently (Jackson, 2001, p. 144).

- Data availability: The primary goal of developing the Open Government Data (OGD) in democratic governments is enhancing transparency and responsibility of the authorities in the high-quality engagement of the public for decision-making (OECD, n. d.). OGD for this reason requires to meet specific criteria including: *"being complete, primary, timely, accessible, machine processable, non-discriminatory, non-proprietary, license-free, online and free, permanent, trusted, a presumption of openness, documented, safe to open, and designed with public input"* (Piovesan, 2015, p. 10).
- Anonymity (Kiesler, Siegel, & McGuire, 1984, as cited in Trevett-Smith, 2009, p. 145; Sadagopan, 2000, p. 10; Carver, 2001, as cited in McCall, 2003, p. 559; Skinner & Biscope, 2003, as cited in Hardiker & Grant, 2011, p. 6; Brabham, 2009, p. 249; Tripp, 2007, p. 36; Tang, 2006, p. 25; Sieber, Robinson, Johnson, & Corbett, 2016, p. 1031; Ramasubramanian, 2008, p. 101; Kingston, Carver, Evans, & Turton, 2000, p. 111; Creighton, 2005, p. 118;): Anonymity in WPPGIS can have different impacts on the quality of participation. Based on the objectives of the participation, authorities and participants can decide whether anonymity or authentication are better choices for their specific project. In online participation, scale, the intensity of participation, users and their characteristics, and the main topic that has initiated participation determine whether anonymity or identity verification is the proper choice (Jankowski, Czepkiewicz, Mlodkowski, Zwolinkski, & Wojcicki, 2017, p. 8). In case of identity verification, type of collected data is also dependent on the context and target group and varies between extensive demographic characteristics to limited to an email address. However, there have been several instances of identity breach and misused information that participation implementers consider identity verification or authentication cautiously. Also, when the service provider is external to authorities or might not be adequately controlled by the implementers, choice of authentication in online participation needs second thoughts. It is recommended to decide about authentication and anonymity in the design phase of the participation with participants providing detailed information on advantages and disadvantages of each approach.
- Feedback on the impact of inputs on a given decision (Brenneis, 1990, p. 39; Creighton, 2005, p. 212; Lukensmeyer, Goldman, & Stern, 2011, p. 60; McGee, 2009, p. 9; Nabatchi, 2012, p. 11; Aichholzer & Westholm, 2009, p. 11): Participants need to know how their participation

has influenced final decisions and it is authorities' responsibility to provide such feedback (Webler, Tuler, & Krueger, 2001, p. 436). Such feedback is a proof that the authorities are accountable and have considered all the opinions in the final decision-making (Brenneis, 1990, p. 39). As a result, participants can trust more to a responsive authority. Proper and functional feedbacking system depends on channels of communication in each project (Brenneis, 1990, p. 39). Providing feedback is especially critical for those participants that their first opinions oppose the final decisions because the feedback can ensure how democratic the decision-making process has been and how all the opinions have been considered before finalizing the decision (Brenneis, 1990, p. 39). Accountability of the authorities encourages further participation in the future (Arnstein, 1969; Berry, Portney, & Thomson, 1993; Day, 1997, as cited in Twitchen & Adams, 2011, p. 2).

- Science-centered stakeholder consultation (Webler & Tuler, 2006, p. 710): Strong and meaningful relationship between experts and participants in participatory decision-making is an important factor affecting the quality of participation (Webler & Tuler, 2006, p. 710). A meaningful relationship is a type of relationship that both parties benefit from their relationship and mutually learn through their connection (FETFX, 2017, p. 12). Experts and scientists would have a unique opportunity then to investigate the cultural relevance of their methodology (American Association for Advancement of Science, 2017). Public participation that is technically and scientifically supported by scientists is an effective approach to practically study diverse views of the public in community-related issues (FETFX, 2017, p. 13).
- Ease of use (Zhao, 2007, p. 6; Elmes, 1991, as cited in Tripp, 2007, p. 22; McCall, 2015, as cited in Sieber, Robinson, Johnson, & Corbett, 2016, p. 1033; Rinner & Bird, 2009, p. 595; Macintosh & Whyte, 2008, p. 24; Kingston, 2000, as cited in Liu, 2007, p. 86; Brown & Wei-Chin, 2013; Halvorsen, 2001; McCall & Dunn, 2012; and Tsai, Lu, Chung, & Lien, 2012, as cited in Jankowski, Czepkiewicz, Mlodkowski, Zwolinkski, & Wojcicki, 2017, p. 5; Ibrahim & Boulos, 2006, as cited in Hardiker & Grant, 2011, p. 8; Preece et al., 1994, p. 401, as cited in Haklay & Tobon, 2003, p. 580; Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 177; Bennett, 2008, p. 176): Compatibility of the designed online system for public participation with HCI requirements should be carefully assessed prior to its public use (Sieber, 2006, p. 407; Haklay & Tobon, 2003, p. 580). Enhancing the quality of the interaction by alternative multimedia, quick FAQs and response system, chat rooms and comment boards, navigable and straightforward

maps, guidelines and tutorials, considering disability in the designs, taggable maps, and up-to-date and reliable information are examples of some of the criteria for designing an easy-to-use web-based participatory system (Macintosh & Whyte, 2008, p. 24; Bugs, Granell, Fonts, Huerta, & Painho, 2010, p. 177).

- The Scale of a WPPGIS project is dependent on the primary goal and objectives of the project (Weiner, Harris, & Craig, 2002, p. 10; Al-Kodmany, 2002, as cited in Tripp, 2007, p. 22; Elwood & Ghose, 2001; and de Man, 2003, as cited in Sieber, 2006, p. 495; Dahl, 1989; Fishkin, 1991, as cited in Roberts, 2004, p. 326; Richards, Blackstock, & Carter, 2004, p. 17; Lukensmeyer, Goldman, & Stern, 2011, p. 37; Johnson & Campbell, 1999, as cited in Liu, 2007, p. 12; Rowe & Frewer, 2004, as cited in Abelson & Gauvin, 2006, p. 31): Applicability of large or small scale participatory project is based on the context, target group and objectives of the participation (Kingston, Carver, Evans, & Turton, 2000, p. 118). For instance, in case of the application of WPPGIS in small village of Slaithwaite, Kingston, Carver, Evans, & Turton (2000) argues that WPPGIS is not suitable tool for small-scale participation and is more efficient if the target population are geographically dispersed in a large area (Kingston, Carver, Evans, & Turton, 2000, p. 118). However, extending participation scale beyond a neighborhood is problematic because participants' commitment and knowledge of the issue decreases in large-scale participation (Jones, 1990, as cited in Ambrose, 2013, p. 31). Integration of offline and online participation would enrich the quality of the results in WPPGIS projects (Wellman, Quan-Haase, Witte, & Hampton, 2001, p. 441).
- Efficiency and adaptiveness (Nielsen, 1993, as cited in Zhao, 2007, p. 58; Barndt, 2002, as cited in Turkucu, 2008, p. 48; Tripp, 2007, p. 79; Roberts, 2004, p. 328; Renn, Webler, & Wiedemann, 1995, p. 103; Couper & Miller, 2008; Brown & Reed, 2009, as cited in Pocewicz, Brown, Nielsen-Pincus, & Schnitzer, 2012, p. 40; Nabatchi, 2012, p. 29; Goetz & Gaventa, 2001; van Kersbergen & van Waarden, 2001; Riggs, 2000; and UNDP, 1997, as cited in McCall, 2003, p. 554; Macintosh & Whyte, 2008, p. 25; Armour, 1991, as cited in Liu, 2007, p. 21; Susskind & Cruikshank, 1987, as cited in Chase, Decker, & Lauber, 2004, p. 630; Brenneis, 1990, p. 33; Aichholzer & Westholm, 2009, p. 13): Efficiency in public participation is dependent on its deliberative arrangements (Gardevarn, 2017, p. 2).Efficiency is assessed based on some democratic characteristics of decision-making such as the diversity of included participants, open and deliberative engagement, and the number of influence decision-makers

can have on the final results (Gardevarn, 2017). Soriani, Buono, Tonino, and Camuffo (2015) studied the requirement of a participatory process to meet the criterion of efficiency:

- All the data and information sources should be open and accessible to all the participants;
- Validating local and scientific knowledge and information through integrating them;
- Encourage active and meaningful engagement of all the diverse parties in decision-making;
- Initiate participatory projects with the support of local leaders to decrease the threat of unsustainable government or external funds; and
- Increase the diversity and extent of stakeholders to enhance cooperation in resolving local issues.

➢ Integration of online and offline processes (Wellman, Quan-Haase, Witte, & Hampton, 2001, p. 441; Tang & Liu, 2016, p. 1084): Integration of offline and online participation would enrich the quality of the results in WPPGIS projects (Wellman, Quan-Haase, Witte, & Hampton, 2001, p. 1084). While it seems that for online participatory decision-making, online participation is the primary method to focus, evaluation of the EVOICE showed that offline meeting was the principal method of participation and it was supplemented by online contribution (Aichholzer & Westholm, 2009, p. 9). However, in the EVOICE evaluation, a lower tendency toward using online system in countries with high computer literacy was an inconclusive result (Aichholzer & Westholm, 2009, p. 9). As a result, diversifying participation techniques would increase participation.

➢ Effectiveness (Tippett et al., 2007, as cited in Reed, 2008, p. 2420; Hodge, 2003, as cited in Zhao, 2007, p. 7; World Bank, 1994, as cited in Warner, 1997, p. 415; Twitchen, 2011; Tripp, 2007, p. 5; Thomas, 1990, p. 436; Tang & Waters, 2005, p. 21; Tang & Liu, 2016, p. 1073; Stern, Gudes, & Svoray, 2009, p. 1072; King, Feltey, & Susel1998, p. 320, as cited in Shipley & Utz, 2012, p. 32; Fiorino, 1990; McCool & Guthrie, 2001; and Smith & McDonough, 2001, as cited in Rowe & Frewer, 2004, p. 91; Rowe & Frewer, 2004, p. 517; Crosby, Kelly, & Schaefer, 1986; Fiorino, 1990; Lynn & Busenberg, 1995; Webler, 1995, Smith, and Nell, & Prystupa, 1997, as cited in Rowe & Frewer, 2000, p. 10; McCall, 2003, p. 557; Martin & Sherington, 1997, p. 207; Kahila-Tani, Broberg, Kytta, & Tyger, 2016, p. 199; Butler, 1996, as cited in Haklay & Tobon, 2003, p. 580; Cunningham & Tiefenbacher, 2008, p. 841; Chess & Purcell, 1999, p.

2685; Brown & Wei-Chin, 2013, p. 565; Brown & Kytta, 2014, p. 134; Brenneis, 1990, p. 83; Aichholzer & Westholm, 2009, p. 11; Abelson & Gauvin, 2006, p. 7): Based on an extensive evaluation of 35 cases of participatory decision-making by Fritsch and Newig (2012), the participants' support of the process and achieved outcomes of a participatory decision-making is essential determinant of the effectiveness and success of participation (Fritsch & Newig, 2012, as cited in Reed, 2008, p. 2421).

- Responsiveness (Webler & Tuler, 2006, p. 707; Beierle & Cayford, 2002, as cited in Twitchen, 2011, p. 5; Macintosh & Whyte, 2008, p. 25; Halvorsen, 2003, as cited in Burton, 2009, p. 271; British Columbia Ministry of Forests, 1984, p. 12, as cited in Brenneis, 1990, p. 62; Aichholzer & Westholm, 2009, p. 13): To evaluate the quality of participation and its relation to participants' judgment of implementers' intention, Halvorsen (2003), evaluated judged performance of authorities, assumed responsiveness, and assessment on how much authorities value other perspectives (Halvorsen, 2003, p. 535). The results proved that determinants of the participation quality have a positive relation to participants' judgment of the authorities' intention (Halvorsen, 2003, p. 535). If participation opportunities are easily accessible, diverse opinions have a chance to be expressed and explained, and meetings are open and not enforced, participants believe that the authorities are trustworthy, accountable and responsive to the public's concerns (Halvorsen, 2003, p. 535). Public and deliberative meetings help participation to believe that the authorities actively consult the public in decision-making (Halvorsen, 2003, p. 536). Also, deliberative discussions and participatory decision-making is a sign of good intention of authorities (Ruscio, 1996, p. 474, as cited in Halvorsen, 2003, p. 536). Responding positively to the participant's expectations increases their trust to authorities (Lauber & Knuth, 1999, p. 34, as cited in Halvorsen, 2003, p. 536).
- The sense of ownership (Webler & Tuler, 2006, p. 705; World Bank, 1994, as cited in Warner, 1997, p. 415; Wondolleck & Yaffee, 2000, as cited in Stern, Gudes, & Svoray, 2009, 1068; Sadagopan, 2000, p. 11; Richards, Blackstock, & Carter, 2004, p. 22; Johnson, Lilja, Ashby, & Garcia, 2004; and Lynam, de Jong, Sheil, Kusumanto, & Evans, 2007, as cited in Reed, 2008, p. 2424; Creighton, 2005, p. 19;): Involved localities in the decision-making about their communities increase their sense of ownership of the project and sustains the results (Warner, 1997, p. 417, as cited in Reed, 2008, p. 2420). When people own the project, they act

more flexible, accept the results and cooperate in the implementation of the project which decreases the potential costs (Reed, 2008, p. 2420).

- Goal clarity (Aichholzer & Westholm, 2009, p. 11; Reed, 2008, p. 2421; Brody, 2003, p. 411): A critical criterion for good participation is designing measurable objectives that can evaluate whether and how a project has met the pre-set objectives (Brody, 2003, p. 411). Furthermore, objectives of participatory decision-making are the very first step to select proper participation methods which is an essential determinant of the quality of participation (Abelson & Gauvin, 2006, p. 11).
- Incorporating local knowledge and resources (Kingston et al., 2000, as cited in Rinner & Bird, 2009, p. 588; Taylor & Overton, 1992, as cited in Liu, 2007, p. 112; Al-Kodmany, 2001, p. 11): Integrating local and scientific knowledge in the decision-making gains validity to both perspectives (Abbot & Gujit, 1998, as cited in Reed, 2008, p. 2426). In a good participatory decision-making role of stakeholders and authorities change (Bers, 2008, p. 139). For example, the public might be consulted as an informant rather than information user (Phillipson & Liddon, 2007, as cited in Reed, 2008, p. 2426). However, there is an ongoing discussion of the accuracy and validity of local knowledge, the applicability of scientific information and whether the information should be transferred or exchanged (Reed, 2008, p. 2426). The ideal approach is participatory decision-making has become changing the flow of information from one-way to two-way (Phillipson & Liddon, 2007, as cited in Reed, 2008, p. 2426).
- Providing feedback to participants (Macintosh & Whyte, 2008, p. 24; Aichholzer & Wesholm, 2009, p. 11; Ambrose, 2013, p. 14; Brenneis, 1990, p. 28): It is the responsibility of the participation initiators to entirely and adequately report back the final results of the participation process to the participants and community members (Macintosh & Whyte, 2008, p. 24). Encouraging further debates about the results is helpful to make them more sustainable. Furthermore, if participants can see clearly how their interests and concerns have been considered in the final decision, they feel a sense of ownership over the results and commit themselves to their implementation (Warner, 1997, p. 417, as cited in Reed, 2008, p. 2420).
- Acceptability (Aichholzer & Westholm, 2009, p. 12; Brenneis, 1990, p. 33; Creighton, 2002, p. 62; Innes & Booher, 2004, as cited in Kahila-Tani, Broberg, Kytta, & Tyger, 2016, p. 209; Laurian & Shaw, 2009, p. 297; Nielson, 1993, as cited in Macintosh & Whyte, 2008, p. 23; Thomas, 1995, as cited in Schlossberg & Shuford, 2005, p. 19; Thomas, 1990, p. 436; Pollak,

1979, as cited in Turkucu, 2008, p. 68): In a functional participatory decision-making, people are more interested and feel committed to providing feedback and response to comments and other stakeholders' opinions. It is mainly due to the amount and quality of the information that they receive within the participatory process and gets informed on the opportunities and limitations. Such informed participants show high acceptability of the final decisions even though it might not be their preferred solution (Gardevarn, 2017, p. 21)

- Accessibility (Rowe & Frewer, 2004, as cited in Abelson & Gauvin, 2006, p. 8; Aichholzer & Westholm, 2009, p. 11; Brenneis, 1990, p. 90; Rinner & Bird, 2009, p. 598; Carver, 2001, p. 11; Liu, 2007, p. 86; Macintosh & Whyte, 2008, p. 25): In a good participation, initiators enhance accessibility not only by facilitating access to computer and Internet but also to interactive communication. It means participants are provided open opportunities to express their concerns through various mediums such as maps, audios, and text messages (Rinner & Bird, 2009, p. 598). It is why some researchers (2009) synonymize or associated accessibility and inclusiveness (p. 11), openness (Brenneis, 1990, p. 90), usability and usefulness (Aichholzer & Westholm, 2009, p. 12), social inclusion, equality, equity, and fairness (Carver, 2001, p. 11; Chess & Purcell, 2003, p. 2688; Kytta, Broberg, Haybatollahi, & Schmidt-Thome, as cited in Kahila-Tani, Broberg, Kytta, & Tyger, 2016, p. 199), and transparency (Drew, 2003, p. 74). As a result, a successful participatory process extends communication and interaction beyond traditional technology access.

The implication of good participation criteria

Relying on the analogy of Rowe and Frewer (2005) on the main goal of participation: *"to acquire all relevant information from all relevant or responsible members of the population (sources) and transfer this to relevant recipients"*, transferring information has been chosen as the core objective of the WPPGIS in shaping the current evaluation framework (Rowe & Frewer, 2005, p. 251).

The public and their roles in participation process is not one precise definition that fits all situations (Creighton, 2005, p. 23). It is a tentative determination that is flexible based on their playing roles in the decision-making (Vasquez & Taylor, 2001, p. 140, as cited in Public, 2018). The public can be defined by their function in the decision-making process as *"source of useful information for resolving community issues or having the power to influence implementation of*

the decisions." (Thomas, 1995, p. 56; Mitchell, Agle, & Wood, 1997 as cited in Schlossberg & Shuford, 2005, p. 19). Furthermore, Schlossberg and Shuford (2005) categorized public based on their position within the decision-making process to the influenced public, informants, and power-holders to implement decisions (Thomas, 1995; Sanoff, 2000, as cited in the Schlossberg and Shuford, 2005, p. 18). These definitions and approaches to deal with the public were applied in the current framework to define the public based on their roles in the transferring information (information recipients or source). In this way, they can change their roles throughout the participation process.

Transferring information is a necessary component of both online and offline participation (Jackson, 2001, p. 144). To propose application of the good participation criteria in the evaluation framework, the thesis used the analogy of the Rowe and Frewer (2005) for the role of information in participation, communication, commitment, and content development (251) to define the role of participants and authorities interacting with information as information developers (creators), collectors, users, interpreters (analyzers), and disseminators (source and recipient of the information) (Rowe & Frewer, 2005, p. 252). Throughout a participatory process from objective-setting, to implementation and closure, information and its interaction with each of the roles mentioned above can be investigated

Authorities need to design a flexible process to involve participants in the evqaluation process (Richards, Blackstock, & Carter, 2004, p. 19). Furthermore, if the roles of the participants in the decision-making process and evaluation change based on the requirements and necessities of the situations, people would have an opportunity to change their roles as participants who need to be informed to participants who are source of information and create knowledge in the process (Carver, 2001, as cited in Tang & Waters, 2005, p. 20).

In conclusion, the various functions of the information determine the structure of the current evaluation framework. The evaluation has been framed in a matrix that can be adapted to different context and situations.

Table 9 Good participation evaluation framework

	Use	**create**	**Analyze**	**Disseminate**	**Collect**
Participation	Early engagement	Stakeholder determination	Agreed community issue	Call for participation	Collect information from formal and informal sources
Communication	Proper notification	Networking	Acceptability	Widespread and applicable communication channels	Recognize relevant parties
Commitment	Responsiveness	Initiate participation	Legitimacy	Transparency	Inclusiveness
Content development	Adequate information	Knowledge exchange	Applicability	Access to information	Usability

Such table (Table 9) can be developed for the online and offline types of participation. By following functions of information (participation, communication, commitment, and content development) for participants'[36] roles (information user, creator, analyzer, disseminator, and collector), good participation evaluation criteria can be selected specifically relevant to a situation and contexts. The framework is flexible to investigate each criterion through different variables, and it would make evaluation multi-dimensional and comprehensive. Instead of measuring pre-set criteria, evaluators can decide about the procedure and content of their evaluation based on their interpretation of the *good* participation.

The framework would initiate questions that can open new discussions on neglected dimensions of each quality. For instance, how information is going to be used for early engagement? While in early engagement, still there are not structured networks for proper notification and announcement, evaluators might discuss on the necessity of local authorities to take the role and use their power in connecting relevant stakeholders based on their interpretation, previous knowledge or experience.

[36] Whoever that has a role in the information transfer process

Conclusion

"Collaboration offers neither a standard template to be adhered to nor a recipe to be followed. It is essentially a process of heuristic learning that is linked to the unique combinations of partners, issues, and context. What works in one situation will not always work in another. This lack of transportability frustrates many, especially policymakers. What that leaves us with is the need to develop a collaboration toolbox of the skills, techniques, practices, and mechanisms that are likely to make a given collaboration more successful than not. The more tools available to any practitioner, the more likely will be his or her success." (Wilson, 2010, p. 14).

The proposed evaluation framework is designed to be used as a guide to design high-quality (good) participation process in WPPGIS. As a result, the current research focuses on designing, rather than evaluating good public participation.

Designing WPPGIS projects based on the good participation criteria can ensure that the result would be a useful and satisfactory WPPGIS for planners, authorities, and the public. There are different criteria to evaluate quality and effectiveness of any participatory tool and method. WPPGIS as a contemporary and integrative method of public participation should also mandate its specified evaluation criteria. However, it is not deniable that many of the extracted and seemingly proper criteria for the evaluation of WPPGIS are doable and practical (Lukensmeyer et al., 2006). However, even though some of the criteria are not measurable, considering them in the design of the WPPGIS for offline and online participation would facilitate reaching to a good WPPGIS process. Participation is a process that is occurring in an interactive and multivariate environment. There are several factors impacting public participation and its quality which are non-controllable and in most of the cases undetectable. Practitioners and participation authorities should decide whether they should or could consider a variable and its influencing factors in their evaluation.

Quality and effectiveness of the public participation in WPPGIS are dependent on the quality of participation in methods of participation. Furthermore, choice of proper participation method is determined by the objectives of the participation. Adding to this equilibrium is the quality of the participation outcome that is dependent on the quality of participation method and feasible objectives. It is why the quality of public participation should be considered all throughout the planning, implementation, and conclusion of the WPPGIS project.

The filed of WPPGIS is missing a standard manual on the evaluation of effective participation and current thesis attempts to recommend a comprehensive evaluation framework that can be adopted for online and offline participation in any given WPPGIS project. While there are several examples of technical evaluation of WPPGIS, this thesis focuses on deliberative quality of the WPPGIS (Jankowski et al., 2003). Furthermore, the primary assumption of the current research is considering several criteria of offline and online participation applicable to both environments.

Criteria for the good participation can be used as a guideline for designing future WPPGIS projects. While the proposed framework has been acquired through literature review and the validity and reliability of the collected criteria have not been tested through repetition in several cases to make it more generalizable, the current thesis proposes the framework as a suggestion to consider in WPPGIS projects. Furthermore, due to insufficient information in this field and despite the fact that many of the available research on participation evaluation were outdated, misleading or lacked enough details on the procedure and results, still their results were considered in the current framework. The primary assumption in this regard was portraying information along each other would clarify knowledge gaps and highlights where further studies need to be invested.

One of the by-products of the current framework is an indirect review of hypothetical good participation in WPPGIS. This review might be a good guideline for authorities and participation planners to design their participation project following the steps of proper participation and find out how they can deal with the limitations (Tang & Liu, 2016).

Each WPPGIS needs its own specified list of evaluation criteria. Furthermore, complete and meaningful application of participation evaluation framework to a WPPGIS project needs extensive resources and information that might not be feasible in many cases. Designing a framework which is comprehensive and feasible at the same time is not an easy task. As a result, it is suggested to design a framework based on the objectives and specificity of each project that has included all the important criteria which are measurable based on the available resources of that project.

WPPGIS is an integration of offline and online environments. As a result, evaluating the quality of the participation in two different environments and interpreting the results as one single project is challenging. Another challenge for the participation evaluation framework is the obstacles facing generalizability and quantitative research in this filed. Finding similar and comparable projects for topics such as public participation is very difficult if not impossible. As previously mentioned, WPPGIS is impacted by several uncontrollable or unrecognizable factors which makes reaching to similar cases in communities with similar socio-demographic, cultural and technological profile difficult.

Participation evaluation criteria are mostly case-oriented which makes validity test a significant challenge (Aichholzer, Kubicek, & Torres, 2015) especially when there is no standard for controlling the quality.

In summary, a good public participation primarily sets clear objectives; determines the roles and tasks of any actor (role-player) in the decision-making, decides about the intensity and level of participation, provides detail on the process and its implication, emphasizes on collecting and considering public input in the process, severely considers the public input in the final decisions and provides feedback on public's influence on the final decisions, collects and analyzes public's feedback on the final results whether agreed with the decision or opposed, It is critical to initiate public engagement as early as possible and maintain in throughout the life span of the project (Reed, 2008). The participation process should be precisely crafted and managed consistently. Participants should be informed of the details of the procedure and how and when they are going to influence the decisions. Explaining the criteria for good participation to participants can be helpful to inform them of their rights and responsibilities. Good participation can facilitate consensus-building and overcoming conflicts. Participants would learn to live with opposite opinions and compromise their interests for their community's well-being. By encouraging dialogues between participants, good participation educates people on all other concerns and interests in their community. Understanding other parties' concerns, participants learn to respect others and look for middle ground solutions. A proper process is transparent about existing power relations in the community. As a result, it is less probable that power-holders can enforce a specific approach to be selected by the community. Legalizing and institutionalizing participation supports conducting good participation and helps to sustain the

process. Public participation has unpredictable results. As the result authorities and power holders need to compromise their controlling power to perform a good participatory process.

The current framework is an attempt to distinguish restricting factors of public participation evaluation and whether the proposed framework can be applied to evaluate participation in WPPGIS.

References

AAAS + Center for public engagement with science & technology. (2017, January 25). Why public engagement matters. Retrieved from https://www.aaas.org/pes/what-public-engagement

Abbot, J., Chambers, R., Dunn, C., Harris, T., Merode, E., Townsend, J., & Weiner, D. (1998). Participatory GIS: Opportunity or oxymoron? *PLA Notes*, *33*, 27-33.

Abbot, J., & Guijt, I. (1997). *Changing views on change: A working paper on participatory monitoring of the environment, Working paper*. International Institute for Environment and Development, London.

Abelson, J., & Gauvin, F. P. (2006). *Assessing the impacts of public participation: Concepts, evidence, and policy implications*. Ottawa, Canada: Canadian Policy Research Networks (CPRN).

Aggens, L. W. (1983). *Identifying different levels of public interest in participation*. Fort Belvoir, VA: The Institute for Water Resources, U.S. Army Corps of Engineers.

Aichholzer, G., & Westholm, H. (2009). Evaluating eParticipation projects: Practical examples and outline of an evaluation framework. *European Journal of ePractice*, *7*. Retrieved from http://observgo.uquebec.ca/observgo/fichiers/86749_AEEPP-3.pdf

Aitken, S. C., & Michel, S. M. (1995). Who contrives the 'real' in GIS? Geographic information, planning, and critical theory. *Cartography and Geographic Information Systems*, *22*(1), 17-29.

Alexander, J. (1999). Networked communities: Citizen governance in the information age. In G. Moore, J. A. Whitt, N. Kleniewski, & G. Rabrenovic (Eds.), *Research in politics and society* (pp. 271-289). Stamford, CT: JAI.

Al-Kodmany, K. (2001). Bridging the gap between technical and local knowledge: Tools for promoting community-based planning and design. *Journal of Agricultural and Planning Research*, *18*(2), 110-130.

Al-Kodmany, K. (2002). Visualization tools and methods in community planning: From freehand sketches to virtual reality. *Journal of Planning Literature*, *17*(2), 189-211. doi:10.1177/088541202762475946

Alterman, R., Harris, D., & Hill, M. (1984). The impact of public participation on planning. *Town Planning Review*, *55*(2), 177-196.

Ambrose, Z. T. (2013). *Evaluating public participation techniques: Improving the planner's toolbox* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

American Planning Association (APA). (1992). Ethical principles in planning. Retrieved from http://www.planning.org/ethics/ethicalprinciples

American Planning Association (APA). (2005). American Institute of certified planners' code of ethics and professional conduct. Retrieved from http://www.planning.org/ethics/ethicscode.htm

Ammouri, R. (2002). *Land Gazette 2000: A prototype virtual workplace for enhanced community involvement in public decision-making* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Amy, D. (1987). *The politics of environmental mediation*. New York, NY: Columbia University Press.

Andrews, L., Higgins, A., Waring-Andrews, M., & Lalor, J. G. (2012). Classic Grounded Theory to analyze secondary data: Reality and reflections. *Grounded Theory Review: An International Journal*, *11*(1). Retrieved from http://groundedtheoryreview.com/2012/06/01/classic-grounded-theory-to-analyse-secondary-data-reality-and-reflections/

Armour, A. M. (1991). The siting of locally unwanted land uses: Towards a cooperative approach. *Progress in Planning*, *35*(1), 1-74. doi:10.1016/0305-9006(91)90007-o

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, *35*(4), 216-224.

Asthana, S., Richardson, S., & Halliday, J. (2002). Partnership working in public policy provision: A framework for evaluation. *Social Policy and Administration*, *36*(7), 780-795. doi:10.1111/1467-9515.00317

Baker, M., Coaffee, J., & Sherriff, G. (2007). Achieving successful participation in the new UK spatial planning system. *Planning, Practice, and Research*, *22*(1), 79-93. doi:10.1080/02697450601173371

Balchin, W. G., & Coleman, A. M. (1966). Graphicacy should be the fourth ace in the pack. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *3*(1), 23-28. doi:10.3138/c7q0-mm01-6161-7315

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544-559. Retrieved from http://nsuworks.nova.edu/tqr/vol13/iss4/2

Baym, N. K. (1997). Interpreting soap operas and creating community. In S. Kiesler (Ed.), *Culture of the Internet* (pp. 103-120). Mahwah, NJ: Erlbaum.

BC Ombudsman. (1980). *Annual report to the Legislative Assembly*. Victoria, Canada: British Columbia, Office of the Ombudsman.

Beierle, T. C. (2002). The quality of stakeholder-based decisions. *Risk Analysis*, *22*(4), 739-749. doi:10.1111/0272-4332.00065

Beierle, T. C., & Cayford, J. (2002). *Democracy in practice: Public participation in environmental decisions*. Washington, DC: Resources for the Future.

Bellamy, J. A. (2004). Moving beyond "talk the talk": Lessons from community-based research partnerships for coastal zone management. In *Coastal Zone Asia Pacific 2004 Conference: Improving the quality of life in coastal areas (CZAP 2004)*.

Berry, J., Portney, K., & Thomson, K. (1993). *The rebirth of urban democracy*. Washington, DC: Brookings Institution.

Bers, M. U. (2008). Civic identities, online technologies: From designing civic curriculum to supporting civic experiences. In W. L. Bennett (Ed.), *Civic life online: Learning how digital media can engage youth*. Massachusetts, MA: The MIT Press.

Biggs, S. D. (1989). *Resource-poor farmer participation in research: A synthesis of experiences from nine national agricultural research systems*. Hague, Netherlands: International Service for National Agricultural Research (ISNAR).

Bimber, B. (2001). Information and political engagement in America: The search for effects of information technology at the individual level. *Political Research Quarterly*, *54*(1), 53-67. doi:10.1177/106591290105400103

Blackburn, C., & Read, J. (2005). Using the Internet? The experiences of parents of disabled children. *Child: Care, Health & development*, *31*, 507-515.

Blackstock, K., Kelly, G., & Horsey, B. (2007). Developing and applying a framework to evaluate participatory research for sustainability. *Ecological Economics*, *60*(4), 726-742. doi:10.1016/j.ecolecon.2006.05.014

Blahna, D. J., & Yonts-Shepard, S. (1989). Public involvement in resource planning: Toward bridging the gap between policy and implementation. *Society & Natural Resources*, *2*(1), 209-227. doi:10.1080/08941928909380686

Bleiker, A., & Bleiker, H. (1995). *Public participation handbook for officials and other professionals serving the public* (9th ed.). Monterey, CA: Institute for Participatory Management and Planning.

Bleiker, H., & Bleiker, A. (1994). *Citizen participation handbook for public officials and other professionals serving the public* (8th ed.). Monterey, CA: Institute for Participatory Management and Planning.

Boase, J., Horrigan, J. B., Wellman, B., & Rainie, L. (2006). The strength of Internet ties: Pew Internet and American Life Project. Retrieved from http://www.pewinternet.org/pdfs/PIP_Internet_ties.pdf

Bonnemann, T. (2010, September 25). Public participation: Four common misconceptions. Retrieved from http://www.intellitics.com/blog/2010/09/25/public-participation-four-common-misconceptions/

Bosworth, M., Donovan, J., & Couey, P. (2002). Portland metro's dream for public involvement. In W. J. Craig, T. M. Harris, & E. Weiner (Eds.), *Community participation and geographic information systems*. London, UK: Taylor & Francis.

Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology*. Chicago, IL: University of Chicago Press.

Brabham, D. C. (2009). Crowd-sourcing the public participation process for planning projects. *Planning Theory*, *8*(3), 242-262. doi:10.1177/1473095209104824

Bracht, N., & Tsouros, A. (1990). Principles and strategies for effective community participation. *Health Promotion International*, *5*(3), 199-208. doi:10.1093/heapro/5.3.199

Brake, D. R. (2014). Are we all online content creators now? Web 2.0 and digital divides. *Journal of Computer-Mediated Communication*, *19*(3), 591-609. doi:10.1111/jcc4.12042

Brants, K., Huizenga, M., & Van Meerten, R. (1996). The new canals of Amsterdam: An exercise in local electronic democracy. *Media, Culture & Society*, *18*(2), 233-247. doi:10.1177/016344396018002004

Brechin, S. R., West, P., Harmon, D., & Kutay, K. (1991). Resident people and protected areas: A framework for inquiry. In P. West & S. Brechin (Eds.), *Resident peoples and national parks: social dilemmas and strategies in international conservation* (pp. 5-28). Tucson, AZ: The University of Arizona Press.

Brenneis, K. (1990). *An evaluation of public participation in the British Columbia Ministry of Forests*. Simon Fraser University Press.

Brenner, B. (2003). Is the provision of laboratory results via the Internet acceptable to patients? A survey of private patients in a large, specialist gynecology practice. *New Zealand Medical Journal*, 116.

Brinkerhoff, J. M. (2002). Assessing and improving partnership relationships and outcomes: A proposed framework. *Evaluation and Program Planning*, *25*(3), 215-231. doi:10.1016/s0149-7189(02)00017-4

British Columbia Ministry of Forests. (1984). *Resource planning manual*. Victoria, Canada: Author.

Brody, S. D. (2003). Measuring the effects of stakeholder participation on the quality of local plans based on the principles of collaborative ecosystem management. *Journal of Planning Education and Research*, *22*(4), 407-419. doi:10.1177/0739456x03022004007

Brown, G. (2015). Engaging the wisdom of crowds and public judgment for land use planning using public participation geographic information systems. *Australian Planner*, *52*(3), 199-209. doi:10.1080/07293682.2015.1034147

Brown, G., Donovan, S., Pullar, D., Pocewicz, A., Toohey, R., & Ballesteros-Lopez, R. (2014). An empirical evaluation of workshop versus survey PPGIS methods. *Applied Geography*, *48*, 42-51. doi:10.1016/j.apgeog.2014.01.008

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

Brown, G., & Reed, P. (2009). Public participation GIS: A new method for use in national forest planning. *Forest Science*, *55*, 166-182.

Brown, G., & Wei-Chin, S. Y. (2013). Assessing the effectiveness of public participation in neighborhood planning. *Planning Practice and Research*, *28*(5), 563-588. doi:10.1080/02697459.2013.820037

Brownill, S., & Carpenter, J. (2007). Increasing participation in planning: Emergent experiences of the reformed planning system in England. *Planning Practice and Research*, *22*(4), 619-634. doi:10.1080/02697450701770134

Bruwer, B. R., & Stein, D. J. (2005). A survey of participants in two internet support groups for people with hair-pulling. *BMC Psychiatry*, *5*(1). doi:10.1186/1471-244x-5-37

Bryant, L., & Wilcox, D. (2006, June). Some lessons from Web 2.0 for participation and E-democracy. Retrieved from http://www.headshift.com/archives/002787.cfm

Bugs, G., Granell, C., Fonts, O., Huerta, J., & Painho, M. (2010). An assessment of Public Participation GIS and Web 2.0 technologies in urban planning practice in Canela, Brazil. *Cities*, *27*(3), 172-181. doi:10.1016/j.cities.2009.11.008

Burton, P. (2009). Conceptual, theoretical and practical issues in measuring the benefits of public participation. *Evaluation*, *15*(3), 263-284. doi:10.1177/1356389009105881

Butterfoss, F. D. (2006). Process evaluation for community participation. *Annual Review of Public Health*, *27*, 323-340.

Buttler, K. A. (1996). Usability engineering turns 10. *interactions*, *3*, 59-75.

Canadian Environmental Assessment Agency. (2008). Public participation guide. Retrieved from https://www.ceaa-acee.gc.ca/46425CAF-50B2-408D-A2A4-EDFAD2A72807/Public_Participation_Guide.pdf

Carlson, C. (1999). Convening. In L. S. Susskind, S. McKernanan, & J. Thomas-Larmer (Eds.), *Consensus-building handbook: A comprehensive guide to reaching an agreement* (pp. 169-184). Thousand Oaks, CA: Sage.

Carnes, S. A., Schweitzer, M., Peelle, E. B., Wolfe, A. K., & Munro, J. F. (1996). *Performance measures for evaluating public participation activities in DOE's Office of Environmental Management*. Washington, DC: U.S. Department of Energy.

Carnes, S., Schweitzer, M., Peelle, E., Wolfe, A., & Munro, J. (1998). Measuring the success of public participation on environmental restoration and waste management activities in the U.S. Department of Energy. *Technology in Society*, *20*(4), 385-406. doi:10.1016/s0160-791x(98)00024-4

Carver, S. (2001). Public participation using web-based GIS. *Environment and Planning B: Planning and Design*, *28*(6), 803-804. doi:10.1068/b2806ed

Carver, S. (2001, December). *Participation and geographical information: a Position paper*. Paper presented at The ESF-NSF workshop on access to geographic information and participatory approaches using geographic information, Spoleto.

Carver, S., Evans, A., Kingston, R., & Turton, I. (1999). *Virtual Slaithwaite: A web-based public participation: Planning for Real*. Retrieved from University of Leeds: School of Geography, Case study report website: http://www.geog.leeds.ac.uk/papers/99-8/

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

Carver, S., Kingston, R., & Turton, I. (1998). *Accessing GIS over the web: An aid to public participation in environmental decision-making*. Retrieved from http://www.geog.leeds.ac.uk/papers/98-3/

Carver, S., & Peckham, R. (1999). Using GIS on the Internet for planning. In J. Stillwell (Ed.), *Geographical Information and Planning* (pp. 371-390). New York, NY: Springer.

Chakraborty, S., & Stratton, R. (1993). An integrated regional approach to risk management of industrial-systems. *Nuclear Safety*, *34*(1), 108.

Chambers, R. (1983). *Rural development: Putting the last first*. London, UK: Longman.

Chang, K. P. (1997). *The design of a web-based geographic information system for community participation* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Chase, L. C., Decker, D. J., & Lauber, T. B. (2004). Public participation in wildlife management: What do stakeholders want? *Society & Natural Resources*, *17*(7), 629-639. doi:10.1080/08941920490466611

Chess, C. (2010). Evaluating environmental public participation: Methodological questions. *Journal of Environmental Planning and Management*, *43*(6), 769-784. doi:10.1080/09640560020001674

Chess, C., & Purcell, K. (1999). Public participation and the environment: Do we know what works. *Environmental Science & Technology*, *33*(16), 2685-2692. doi:10.1021/es980500g

Chua, Y. L., & Wong, S. (2002). Data intermediation and beyond: How the web modifies the dissemination of GIS information. *URISA*. Retrieved from http://www.urisa.org/ppgis/2002/papers/swong.pdf

The city of Edmonton. (2017). *The council initiative on public engagement: Phase 1 and 2, Final report*. Open City.

Clark, A. (2014). Where 2.0 Australia's environment? Crowdsourcing volunteered geographic information, and citizens acting as sensors for environmental sustainability. *ISPRS International Journal of Geo-Information*, *3*(3), 1058-1076. doi:10.3390/ijgi3031058

Clarkson, M. B. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *The Academy of Management Review*, *20*(1), 92. doi:10.2307/258888

Cline, R. J., & Haynes, K. M. (2001). Consumer health information seeking on the Internet: state of the art. *Health Education Research*, *16*(6), 671-692. doi:10.1093/her/16.6.671

Connor, D. M. (1988). A new ladder of citizen participation. *National Civic Review*, *77*(3), 249-257. doi:10.1002/ncr.4100770309

Connors, J. P., Lei, S., & Kelly, M. (2012). Citizen science in the age of Neogeography: Utilizing volunteered geographic information for environmental monitoring. *Annals of the Association of American Geographers*, *102*(6), 1267-1289. doi:10.1080/00045608.2011.627058

Cooke, B. (2001). The social psychological limits of participation? In B. Cooke & U. Kothari (Eds.), *Participation: The new tyranny?* (pp. 102-121). London, UK: Zed Books.

Cooke, B., & Kothari, U. (2002). *Participation, the new tyranny?* London, UK: Zed Books.

Coppedge, M., & Reinicke, W. H. (1990). Measuring Polyarchy. *Studies In Comparative International Development*, *25*(1), 51-72. doi:10.1007/bf02716905

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, *13*(1), 3-21. doi:10.1007/bf00988593

Cornell Empowerment Group. (1989). Empowerment and family support. *Networking Bulletin*, *1*, 1-23.

Couper, M. P., & Miller, P. V. (2008). Web survey methods: Introduction. *Public Opinion Quarterly*, *72*, 831-835.

Couper, M. P., & Miller, P. V. (2008). Web survey methods: Introduction. *Public Opinion Quarterly*, *72*, 831-835.

Craglia, M., & Onsrud, H. (2003). Workshop on access to geographic information and participatory approaches in using geographic information. *URISA: Access and Participatory Approaches (APA II)*, *15*, 9-15. Retrieved from http://www.urisa.org/Journal/APANo2/craglia.pdf

Craig, W. J., Harris, T. M., & Weiner, D. (Eds.). (2002). *Community participation and geographic information systems*. London, UK: Taylor & Francis.

Craig, W. (1998). The Internet aids community participation in the planning process. *Computers, Environment and Urban Systems*, *22*(4), 393-404. doi:10.1016/s0198-9715(98)00033-7

Creighton, J. L. (1983). *Identifying publics/staff identification techniques*. Fort Belvoir, VA: The Institute for Water Resources, U.S. Army Corps of Engineers.

Creighton, J. L. (2005). *The public participation handbook: Making better decisions through citizen involvement*. San Francisco, CA: John Wiley & Sons.

Crosby, N., Kelly, J. M., & Schaefer, P. (1986). Citizens panels: A new approach to citizen participation. *Public Administration Review*, *46*(2), 170. doi:10.2307/976169

Cunningham, C. A., & Tiefenbacher, J. P. (2008). Evaluating the effectiveness of public participation efforts by environmental agencies: Repermitting a smelter in El Paso, Texas, USA. *Environment and Planning C: Government and Policy*, *26*(4), 841-856. doi:10.1068/c2811r

Cupps, D. S. (1977). Emerging problems of citizen participation. *Public Administration Review*, *37*(5), 478. doi:10.2307/974695

Czepkiewicz, M., Jankowski, P., & Mlodkowski, M. (2016). Geo-questionnaires in urban planning: Recruitment methods, participant engagement, and data quality. *Cartography and Geographic Information Science*, *44*(6), 551-567. doi:10.1080/15230406.2016.1230520

Czepkiewicz, M., & Snabb, K. (2013). ‘‘Lean’’ public participation GIS: Towards a sustainable tool for participatory urban planning. In *GIS Ostrava 2013 – Geoinformatics for City Transformation*. Ostrava, Czech Republic.

Dahl, R. A. (1989). *Democracy and its critics*. New Haven, CT: Yale University Press.

Danielson, S., Webler, T., & Tuler, S. P. (2009). Using Q Method for the formative evaluation of public participation processes. *Society & Natural Resources*, *23*(1), 92-96. doi:10.1080/08941920802438626

Davidoff, P. (1965). Advocacy and pluralism in planning. *Journal of the American Institute of Planners*, *31*(4), 103-115.

Davidson, S. (1998). Spinning the wheel of empowerment. *Planning*, *3*, 14-15.

Day, D. (1997). Citizen participation in the planning process: An essentially contested concept? *Journal of Planning Literature*, *11*(3), 421-434. doi:10.1177/088541229701100309

De Man, W. H. (2003). Cultural and institutional conditions for using geographic information: Access and participation. *URISA (Urban and Regional Information Systems Association)*, *15*(1), 29-34. Retrieved from http://www.urisa.org/Journal/APANo1/de_man.pdf

Della Mea, V. (2001). What is e-Health (2): The death of telemedicine? *Journal of Medical Internet Research*, *3*(2), E22. doi:10.2196/jmir.3.2.e22

Dennis, A. R., & Valacich, J. S. (1999). *Rethinking media richness: Towards a theory of media synchronicity*. Paper presented at The 32nd Hawaii International Conference on System Sciences, Los Alamitos: IEEE.

Di Gennaro, C., & Dutton, W. (2006). The Internet and the public: Online and offline political participation in the United Kingdom. *Parliamentary Affairs*, *59*(2), 299-313. doi:10.1093/pa/gsl004

Diamond, A. R., & Morlino, L. (Eds.). (2005). *Assessing the quality of democracy*. Baltimore, MD: The John Hopkins University Press.

Dickerson, S., Reinhart, A. M., Feeley, T. H., Bidani, R., Rich, E., Garg, V. K., & Hershey, C. O. (2004). Patient Internet use for health information at three urban primary care clinics. *Journal of the American Medical Informatics Association*, *11*(6), 499-504. doi:10.1197/jamia.m1460

Dobson, T. M., & Willinsky, J. (2009). Digital literacy. In D. R. Olson & N. Torrance (Eds.), *The Cambridge handbook of literacy* (pp. 286-312). Cambridge, UK: Cambridge University Press.

Dorcey, A. H., & British Columbia Round Table on the Environment and the Economy. (1994). *Public involvement in government decision-making: Choosing the right model : a report of the B.C. Round Table on the Environment and the Economy*. Victoria, B.C.: The Round Table.

Dougill, A. J., Fraser, E. D., Holden, J., Hubacek, K., Prell, C., Reed, M. S., … Stringer, L. C. (2006). Learning from Doing Participatory Rural Research: Lessons from the Peak District National Park. *Journal of Agricultural Economics*, *57*(2), 259-275. doi:10.1111/j.1477-9552.2006.00051.x

Dragicevic, S., & Balram, S. (2004). A web GIS collaborative framework to structure and manage distributed planning processes. *Journal of Geographical Systems*, *6*(2), 133-153. doi:10.1007/s10109-004-0130-7

Dressler, L. (2006). *Consensus through conversation: How to achieve high-commitment decisions*. San Francisco, CA: Berrett-Koehler Publishers.

Drew, C. (2003). Transparency: Considerations for PPGIS research and development. *URISA*, *15*, 73-78.

Dunster, J. A. (1988). *Conflict in Canadian forestry* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

The Economist. (2010, November 10). The true true size of Africa. Retrieved from https://www.economist.com/blogs/dailychart/2010/11/cartography

eHealth. (2017, August 8). Retrieved from https://en.wikipedia.org/wiki/EHealth

Elmes, G. A. (1991). Design and implementation of a user interface for decision support in natural resource management. In *GIS/LIS '91 Proceeding* (pp. 399-406).

Elwood, S., & Ghose, R. (2001). PPGIS in community development planning: Framing the organizational context. *Cartographica*, *38*(3), 19-34. doi:10.1002/9780470669488.ch8

Engaging with the public. (n.d.). Retrieved from http://www.extension.umn.edu/community/civic-engagement/tip-sheets/consensus-decision-making/

English language & usage. (2013, September 18). Is there a word for "map illiteracy" or "geographic illiteracy"? Retrieved from https://english.stackexchange.com/questions/127715/is-there-a-word-for-map-illiteracy-or-geographic-illiteracy

e-participation. (2018, February 20). Retrieved May 19, 2017, from https://en.wikipedia.org/wiki/E-participation

Erhmann, J. R., & Stinson, B. (1999). Joint fact-finding and the use of technical experts. In L. S. Susskind, S. McKernanan, & J. Thomas-Larmer (Eds.), *Consensus-building handbook: A comprehensive guide to reaching an agreement* (pp. 375-398). Thousand Oaks, CA: Sage.

Eshet-Alkalai, Y., & Chajut, E. (2009). Changes over time in digital literacy. *CyberPsychology and Behavior*, *12*(6), 713-715. doi:10.1089/cpb.2008.0264

Eshet, Y., & Aviram, R. (2006). Towards a theory of digital literacy: Three scenarios for the next steps. *European Journal of Open Distance E-Learning*. Retrieved from http://www.eurodl.org/index.php?p=archivesandyear=2006andhalfyear=landarticle=223

Evans, A., Kingston, R., Carver, S., & Turton, I. (1999). *Web-based GIS used to enhance public democratic involvement*. Paper presented at GeoComputation '99, Mary Washington College, Virginia, USA. Retrieved from http://www.geog.leeds.ac.uk/papers/99-1/

Evans-Cowley, J., & Hollander, J. (2010). The new generation of public participation: Internet-based participation tools. *Planning Practice and Research*, *25*(3), 397-408. doi:10.1080/02697459.2010.503432

Farrington, J. (1998). Organisational roles in farmer participatory research and extension: Lessons from the last decade. *Natural Resource Perspectives*, *27*, 1-4.

Federal Highway Administration (FHWA). (2003). *Public involvement web page*. Retrieved from U.S. Department of Transportation website: http://www.fhwa.dot.gov/environment/pubinv2.htm

FETFX. (2017). *A practical guide for public engagement in future and emerging technologies*. Retrieved from EFFECT Project website: http://www.fetfx.eu/wp-content/uploads/2017/06/EFFECT-Guide-on-Public-Engagement.pdf

Fiorino, D. J. (1990). Citizen participation and environmental risk: A survey of institutional mechanisms. *Science, Technology, & Human Values*, *15*(2), 226-243. doi:10.1177/016224399001500204

Fischer, C. (2001, August). *Bowling alone: What's the score?* Paper presented at The American Sociological Association Conference, Anaheim.

Fischer, F. (2000). *Citizens, experts, and the environment: The Politics of Local Knowledge*. London, UK: Duke University Press.

Fishkin, J. S. (1991). *Democracy and Deliberation: New directions for democratic reform*. New Haven, CT: Yale University Press.

Fogel, J., Albert, S. M., Schnabel, F., Ditkoff, B. A., & Neugut, A. I. (2002). Use of the Internet by women with breast cancer. *Journal of Medical Internet Research*, *4*(2), E9. doi:10.2196/jmir.4.2.e9

Fong, E., Wellman, B., Wilkes, R., & Kew, M. (2001). *The double digital divide*. Ottawa, Canada: Office of Learning Technologies.

Forester, J. (1989). *The challenge of daily planning practice: Planning in the face of power*. Berkeley, CA: University of California Press.

Forester, J. (1992). Envisioning the politics of public sector dispute resolution. *Law, Politics, and Society*, *12*, 247-286.

Forester, J. (1999). *The deliberative practitioner*. Cambridge, MA: MIT Press.

Fraser, B. (1990, July 11). Senior partner of Salasan Associates Inc. Interview by K. Brenneis. Victoria.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston, MA: Pitman Publishing.

Freudenberg, W. R., & Olsen, D. (1983). Public interest and political abuse: Public participation in social impact assessment. *Journal of the Community Development Society*, *14*, 67-82.

Frewer, L. (1999). Public risk perceptions and risk communication. In P. Bennett & K. Calman (Eds.), *Risk communication and public health* (pp. 20-32). Oxford, UK: Oxford University Press.

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

Fritsch, O., & Newig, J. (2012). Participatory governance and sustainability: Early findings of a meta-analysis of stakeholder involvement in environmental decision-making. In *Reflexive governance for global public goods* (pp. 181-203). Cambridge, MA: The MIT Press.

Frooman, J. (1999). Stakeholder influence strategies. *The Academy of Management Review*, *24*(2), 191. doi:10.2307/259074

Ganapati, S. (2010). *Using geographic information systems to increase citizen engagement*. Retrieved from IBM Center for the Business of Government website: www.businessofgovernment.org/sites/default/files/GanapatiReport.pdf

Gardevarn, D. (2017). *PPGIS and public meetings: An evaluation of public participation methods for urban planning* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Gastil, J., & Levine, P. (2005). *The deliberative democracy handbook: Strategies for effective civic engagement in the 21st century*. San Francisco, CA: Jossey Bass.

Ghose, R. (2003). Community participation, spatial knowledge production, and GIS use in inner-city revitalization. *Journal of Urban Technology*, *10*(1), 39-60. doi:10.1080/1063073032000086326

Gibson, R. K., Lusoli, W., & Ward, S. (2005). Online participation in the UK: Testing a contextualized model of Internet effects. *The British Journal of Politics and International Relations*, *7*(4), 561-583. doi:10.1111/j.1467-856x.2005.00209.x

Ginsberg, W. R. (2011). *The Obama administration's open government initiative: Issues for Congress*. Washington, DC: Congressional Research Service, Library of Congress.

Goetz, A. M., Gaventa, J., & Cornwall, A. (2001). *Bringing citizen voice and client focus into service delivery*. Brighton: Institute of Development Studies.

Goetz, A. M., & Gaventa, J. (2001). Governance: Bringing citizen voice and client focus into service delivery. *University of Sussex (IDS Working Paper)*, *138*.

Goodchild, M. F. (1995). GIS and geographic research. In J. Pickles (Ed.), *Ground truth: The social implication of Geographic Information Systems*. New York, NY: The Guilford Press.

Gray, B. (1989). *Collaborating: Finding common ground for multi-party problems*. San Francisco, CA: Jossey-Bass.

Green Map. (2018, January 25). Retrieved March 23, 2018, from https://en.wikipedia.org/wiki/Green_Map

Green, H. E. (2014). Use of theoretical and conceptual frameworks in qualitative research. *Nurse Researcher*, *21*(6), 34-38. doi:10.7748/nr.21.6.34.e1252

Greenwood, D. J., Whyte, W. F., & Harkavy, I. (1993). Participatory action research as a process and as a goal. *Human Relations*, *46*(2), 175-192. doi:10.1177/001872679304600203

Guest, A. M., & Wierzbicki, S. K. (1999). Social ties at the neighborhood level. *Urban Affairs Review*, *35*(1), 92-111. doi:10.1177/10780879922184301

Gui, M., & Argentin, G. (2011). Digital skills of the Internet natives: Differences of digital literacy in a random sample of northern Italian high school students. *New Media & Society*, *2*(17), 1-18.

Haase, A. Q., Wellman, B., Witte, J., & Hampton, K. (2002). Capitalizing on the Internet: Social contact, civic engagement, and sense of community. In B. Wellman & C. Haythornthwaite (Eds.), *The Internet in Everyday Life*. Oxford, UK: Blackwell.

Habermass, J. (1987). *Theory of communicative action*. Cambridge, UK: Polity Press.

Hadden, S. G. (1995). Regulatory negotiation as citizen participation: A critique. In *Fairness and competence in citizen participation: Evaluating models for environmental discourse*. Massachusetts, MT: Springer Science + Business Media Dordrecht.

Haklay, M., & Tobon, C. (2003). Usability evaluation and PPGIS: towards a user-centered design approach. *International Journal of Geographical Information Science*, *17*(6), 577-592. doi:10.1080/1365881031000114107

Hall, B., & Leahy, M. (2008). Design and implementation of a map-centered synchronous collaboration tool using open source components: The MapChat PROJECT. In B. Hall & M. Leahy (Eds.), *Open source approaches in spatial data handling* (pp. 221-245). Berlin, Germany: Springer.

Halvorsen, K. E. (2001). Assessing public participation techniques for comfort, convenience, satisfaction, and deliberation. *Environmental Management*, *28*(2), 179-186. doi:10.1007/s002670010216

Halvorsen, K. E. (2003). Assessing the effects of public participation. *Public Administration Review*, *63*(5), 535-543.

Hammond, H. (1989). *Public forests or private timber supplies? The need for community control of British Columbia's forests*. Winlaw, Canada: Silva Ecosystem Consultants Ltd.

Hansen, B. (1994). *Report on the seminar on the integration of indigenous peoples and their knowledge*. Ministry for the Environment (Iceland), Ministry of the Environment (Denmark), and the Home Rule of Greenland (Denmark Office) Copenhagen, Denmark.

Hardiker, N. R., & Grant, M. J. (2011). Factors that influence public engagement with eHealth: A literature review. *International Journal of Medical Informatics*, *80*(1), 1-12. doi:10.1016/j.ijmedinf.2010.10.017

Hardyman, R., Hardy, P., Brodie, J., & Stephens, R. (2005). It's good to talk: comparison of a telephone helpline and website for cancer information. *Patient Education and Counseling*, *57*(3), 315-320. doi:10.1016/j.pec.2004.08.009

Hargittai, E. (2005). Survey measures of web-oriented digital literacy. *Social Science Computer Review*, *23*(3), 371-379. doi:10.1177/0894439305275911

Hargittai, E. (2009). Update on survey measures of web-oriented digital literacy. *Social Science Computer Review*, *27*(1), 130-137. doi:10.1177/0894439308318213

Harris, T., & Weiner, D. (Eds.). (1996). *GIS and Society: The Social Implications of How People, Space, and Environment Are Represented in GIS*. California, CA: Scientific Report for the Initiative 19 Specialist Meeting (96-7).

Harris, T. M., Weiner, D., Warner, T., & Levin, R. (1995). Pursuing social goals through participatory GIS: Redressing south Africa's historical, political ecology. In J. Pickles (Ed.), *Ground truth: The social implications of geographic information systems* (pp. 196-222). New York, NY: The Guilford Press.

Harris, T. M., & Weiner, D. (2002). Implementing a community-integrated GIS: Perspectives from South African fieldwork. In D. Weiner, T. M. Harris, & W. J. Craig (Eds.), *Community participation and Geographic Information Systems* (pp. 246-258). London, UK: Taylor & Francis.

Harris, T., & Weiner, D. (1998). Empowerment, marginalisation, and "community-integrated" GIS. *Cartography and Geographic Information Systems*, *25*(2), 67-76. doi:10.1559/152304098782594580

Hartz-Karp, J., & Sullivan, B. (2014). The unfulfilled promise of online deliberation. *Journal of Public Deliberation*, *10*(1).

Hassan, M. M. (2005). Arsenic poisoning in Bangladesh: Spatial mitigation planning with GIS and public participation. *Health Policy*, *74*(3), 247-260. doi:10.1016/j.healthpol.2005.01.008

Healey, P. (1997). *Collaborative planning: Shaping places in fragmented societies*. Vancouver, Canada: UBC Press.

Hickey, S., & Mohan, G. (2005). *Participation: From tyranny to transformation: Exploring new approaches to participation in development*. London, UK: Zed Books.

Ho, A. T. (2002). Reinventing local governments and the E-Government initiative. *Public Administration Review*, *62*(4), 434-444. doi:10.1111/0033-3352.00197

Hodge, G. (2003). *Planning Canadian communities: An introduction to the principles, practice, and participants*. Toronto, Canada: Nelson Thomson Learning.

Horelli, L. (2002). A methodology of participatory planning. In R. Bechtel & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 607-628). New York, NY: John Wiley.

How to evaluate public involvement: Step 7: Evaluate public involvement activities. (2003). Retrieved from U.S. Environmental Protection Agency, National Center for Environmental Innovation website: https://www.epa.gov/sites/production/files/2015-09/documents/evaluate508.pdf

IAP2 (International Association for Public Participation). (2007). *Spectrum for public participation*. Retrieved from http://iap2.org/associations/IAP2spectrumvertical.pdf

Ibrahim, E. M., & Boulos, M. N. (2006). Access to online information by adult Saudi cancer patients. *Journal of Health*, *5*, 11. doi:10.1300/j381v10n04_04

Im, E., & Chee, W. (2008). The use of Internet cancer support groups by ethnic minorities. *Journal of Transcultural Nursing*, *19*(1), 74-82. doi:10.1177/1043659607309140

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

Innes, J. E. (1996). Planning through consensus building: A new view of the comprehensive planning ideal. *Journal of the American Planning Association*, *62*(4), 460-472. doi:10.1080/01944369608975712

Innes, J. E. (1998). Information on communicative planning. *Journal of the American Planning Association*, *64*(1), 52-63. doi:10.1080/01944369808975956

Innes, J. E. (1999). Evaluating consensus-building. In L. S. Susskind, S. McKernanan, & J. Thomas-Larmer (Eds.), *Consensus-building handbook: A comprehensive guide to reaching an agreement* (pp. 631-671). Thousand Oaks, CA: Sage.

Innes, J. E., & Booher, D. E. (1999). Consensus-building and complex adaptive systems: A framework for evaluating collaborative planning. *Journal of American Planning Association*, *65*(4), 413-422.

Innes, J. E., & Booher, D. E. (2000). *Public participation in planning: New strategies for the 21st century*. Berkeley, CA: Institute of Urban and Regional Development, University of California.

Innes, J. E., & Booher, D. E. (2005). Reframing public participation: strategies for the 21st century. *Planning Theory and Practice*, *5*(4), 419-436. doi:10.1080/1464935042000293170

Jackson, L. S. (2001). Contemporary public involvement: Toward a strategic approach. *Local Environment*, *6*(2), 135-147. doi:10.1080/13549830120052782

Janis, I. L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes*. Boston, MA: Houghton, Mifflin.

Jankowski, P., Czepkiewicz, M., & Młodkowski, M. (2015). Geo-questionnaire: A method and tool for public preference elicitation in land use planning. *Transactions in GIS*, *20*(6), 903-924. doi:10.1111/tgis.12191

Jankowski, P., Czepkiewicz, M., Młodkowski, M., Zwoliński, Z., & Wójcicki, M. (2017). Evaluating the scalability of public participation in urban land use planning: A comparison of GeoWeb methods with face-to-face meetings. *Environment and Planning B: Urban Analytics and City Science*, *0*(0), 1-23. doi:10.1177/2399808317719709

Jankowski, P., & Nyerges, T. (2003). Toward a framework for research on geographic information-supported participatory decision making. *URISA: Access and Participatory Approach (APA I)*, *15*, 9-17. Retrieved from http://www.urisa.org/Journal/APANo1/jankowski.pdf

Jenkins, H., Clinton, K., Purushotma, R., Robinson, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*. Paper presented at The MacArthur Foundation.

Jensen, D. A., & Field, D. R. (2005). Managing growth and development in a natural-amenity-rich landscape: Landowner attitudes toward planning in northwestern Wisconsin. In G. P. Green, S. Deller, & D. W. Marcouiller (Eds.), *Amenities and rural development: Theory, methods and public policy*. Cheltenham, UK: Edward Elgar Publishing.

Johnson, B. R., & Campbell, R. (1999). Ecology and participation in landscape-based planning within the Pacific Northwest. *Policy Studies Journal*, *27*, 502-529.

Johnson, N., Lilja, N., Ashby, J. A., & Garcia, J. A. (2004). The practice of participatory research and gender analysis in natural resource management. *Natural Resources Forum*, *28*(3), 189-200. doi:10.1111/j.1477-8947.2004.00088.x

Jones, B. (1990). *Neighbourhood planning: A guide for citizens and planners*. Chicago, IL: American Planners Association.

Kahila-Tani, M., Broberg, A., Kyttä, M., & Tyger, T. (2015). Let the citizens map: Public participation GIS as a planning support system in the Helsinki master plan process. *Planning Practice & Research*, *31*(2), 195-214. doi:10.1080/02697459.2015.1104203

Kalof, L. (1997). Understanding the social construction of environmental concern. *Research in Human Ecology*, *4*(2), 101-105.

Katz, J., & Rice, R. (2002). Syntopia: Access, civic involvement and social interaction on the net. In B. Wellman & C. Haythornthwaite (Eds.), *The internet in everyday life*. Oxford, UK: Blackwell.

Kemp, K. K. (2008). *Encyclopedia of Geographic Information Science*.

Kiesler, S., Siegel, J., & McGuire, T. (1984). Social psychological aspects of computer-mediated communication. *American Psychologist*, *39*(10), 1123.

King, C. S., Feltey, K. M., & Susel, B. O. (1998). The question of participation: Toward authentic public participation in public administration. *Public Administration Review*, *58*(4), 317-326. doi:10.2307/977561

Kingston, R. (2002). The role of e-government and public participation in the planning process. In *XVI AESOP Congress*. Retrieved from http://www.ccg.leeds.ac.uk/democracy/presentations/AESOP_kingston.pdf

Kingston, R. (2002). Web-based PPGIS in the United Kingdom. In *Community participation and geographic information systems*. New York, NY: Taylor & Francis.

Kingston, R. (2007). Public participation in local policy decision-making: The role of web-based mapping. *The Cartographic Journal*, *44*(2), 138-144. doi:10.1179/000870407x213459

Kingston, R., Carver, S., Evans, A., & Turton, I. (1999). Virtual decision-making in spatial planning: Web-based geographical information systems for public participation environmental decision-making. Retrieved from http://www.geog.leeds.ac.uk/papers/99-9/

Kingston, R., Carver, S., Evans, A., & Turton, I. (2000). Web-based public participation geographical information systems: An aid to local environmental decision-making. *Computers, Environment and Urban Systems*, *24*(2), 109-125. doi:10.1016/s0198-9715(99)00049-6

Kirby, S. L., Greaves, L., & Reid, C. (2006). *Experience research social change: Methods beyond the mainstream* (2nd ed.). Peterborough, Canada: Broadview Press.

Klein, H. K. (1999). Tocqueville in cyberspace: Using the Internet for citizen associations. *The Information Society*, *15*(4), 213-220. doi:10.1080/019722499128376

Knopp, T. B., & Caldbeck, E. S. (1990). The role of participatory democracy in forest management. *Journal of Forestry*, *88*(5), 13-18.

Konisky, D. M., & Beierle, T. C. (2001). Innovations in public participation and environmental decision making: Examples from the Great Lakes region. *Society & Natural Resources*, *14*(9), 815-826. doi:10.1080/089419201753210620

Koontz, T. M., Carmin, J., Steelman, T., & Thomas, C. (2004). *Collaborative environmental management: What roles for government?* Washington, DC: Resources for the Future Press.

Koontz, T. M., & Thomas, C. W. (2006). What do we know and need to know about the environmental outcomes of collaborative management? *Public Administration Review*, *66*, 111-121. doi:10.1111/j.1540-6210.2006.00671.x

Kothari, U. (2001). Power, knowledge and social control in participatory development. In B. Cooke & U. Kothari (Eds.), *Participation: The new tyranny?* (pp. 139-152). London, UK: Zed Books.

Kyem, P. (2004). In intractable conflicts and participatory GIS applications: The search for consensus amidst competing claims and institutional demands. *Annals of the Association of American Geographers, 94*(1), 37-57.

Kytta, M., Broberg, A., Haybatollahi, M., & Schmidt-Thome, K. (2015). Urban happiness: a Context-sensitive study of the social sustainability of urban settings. *Environment and Planning B: Planning and Design*, *43*(1), 34-57. doi:10.1177/0265813515600121

Laird, F. N. (1993). Participatory analysis, democracy, and technological decision making. *Science, Technology, & Human Values*, *18*(3), 341-361. doi:10.1177/016224399301800305

Lake, R. W., & Disch, L. (1992). Structural constraints and pluralist contradictions in hazardous-waste regulation. *Environment and Planning A*, *24*(5), 663-681. doi:10.1068/a240663

Lane, M. B. (2005). Public participation in planning: An intellectual history. *Australian Geographer*, *36*(3), 283-299. doi:10.1080/00049180500325694

Lauber, T. B. (1999). Measuring fairness in citizen participation: A case study of moose management. *Society & Natural Resources*, *12*(1), 19-37. doi:10.1080/089419299279867

Lauber, T. B., & Knuth, B. A. (1999). Measuring fairness in citizen participation: a case study of moose management. *Society & Natural Resources*, *12*(1), 19-37. doi:10.1080/089419299279867

Laurian, L., & Shaw, M. M. (2008). Evaluation of public participation: The practice of certified planners. *Journal of Planning Education and Research*, *28*(3), 293-309. doi:10.1177/0739456x08326532

Lave, J., & Wegner, E. (1991). *Situational learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Laverack, G. (2001). Identification and interpretation of the organizational aspects of community empowerment. *Community Development Journal*, *36*(2), 134-145. doi:10.1093/cdj/36.2.134

Lawrence, A. (2006). 'No personal motive?' Volunteers, biodiversity, and the false dichotomies of participation. *Ethics, Place & Environment*, *9*(3), 279-298. doi:10.1080/13668790600893319

Leahy, M., Hall, G. B., Findlay, D., Nicholls, T., & Feick, R. (2006). *Implementation of synchronous, spatially-referenced discussion between multiple users with open-source web GIS and database tools*. Paper presented at FOSS4G2006: Free and Open Source software for Geoinformatics, 11-15 September, Lausanne.

Leeuwis, C., & Pyburn, R. (2002). *Wheelbarrows full of frogs: Social learning in rural resource management*. Assen, The Netherlands: Koninklijke van Gorcum.

Leitner, H., McMaster, R. B., Elwood, S., McMaster, S., & Sheppard, E. (2002). Models for making GIS available to community organizations: Dimensions of difference. In D. Weiner, T. M. Harris, & W. J. Craig (Eds.), *Community participation and Geographic Information Systems* (pp. 37-52). London, UK: Taylor & Francis.

Leminsky, G. (1997). Burgerbeteiligung, Mitbestimmung und Gewerkschaften - Eine vorlaufige Ubersicht. In H. Matthofer (Ed.), *Burgerbeteiligung und Burgerinitiativen* (pp. 282-293). Villingen, Germany: Neckar Verlag.

Lemos, M. (2006, May 31). Is PHP ready for Web 2.0? Retrieved from https://www.phpclasses.org/blog/post/53-Is-PHP-ready-for-Web-20.html

Lennie, J., Tacchi, J., Koirala, B., Wilmore, M., & Skuse, A. (2011). *Equal access participatory monitoring and evaluation toolkit*. Retrieved from http://www.betterevaluation.org/sites/default/files/EA_PM%26E_toolkit_module_2_objectives%26indicators_for_publication.pdf

Levy, P. I. (1997). *Collective intelligence: Mankind's emerging world in cyberspace*. New York, NY: Plenum Trade.

Lin, N. (2001). *Social capital*. Cambridge, UK: Cambridge University Press.

Lippa, B., Aichholzer, G., Allhutter, D., Freschi, A. C., Macintosh, A., Moss, G., & Westholm, H. (2008). *eParticipation evaluation and impact: DEMO-net booklet 13.3*. Retrieved from http://ics.leeds.ac.uk/Research/CdC/CdC%20Publications/DEMOnet_booklet_13.3_eParticipation_evaluation.pdf

Liu, Z. (2007). *Internet-based PPGIS for public involved spatial decision-making* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Livingstone, S., & Helsper, E. (2010). Balancing opportunities and risks in teenagers' use of the internet: the role of online skills and internet self-efficacy. *New Media & Society*, *12*(2), 309-329. doi:10.1177/1461444809342697

The Local Government Commission. (n.d.). The public. Retrieved from http://www.lgc.org/people/public.html

Lowndes, V., Stoker, G., & Pratchett, L. (1998). *Guidance on enhancing public participation in local government: A report to the Department of the Environment, Transport, and the Regions*. London, UK: Department of the Environment, Transport, and the Regions.

Lowndes, V., Stoker, G., Pratchett, D., Wilson, D., Leach, S., & Wingfield, M. (1998). *Enhancing public participation in local government: A research report*. London, UK: Department of the Environment, Transport, and the Regions.

Lowry, K., Adler, P., & Milner, N. (1997). Participation the public: Group process, politics, and planning. *Journal of Planning Education, and Research*, *16*(3), 177-187.

Lucas, A. R. (1976). Legal foundations for public participation in environmental decision-making. *Natural Resources Journal*, *16*(1), 73-102.

Lukensmeyer, C. J., Goldman, J. P., & Stern, D. (2011). *Assessing public participation in an open government era: A review of federal agency plans*. Washington, DC: IBM Center for the Business of Government.

Lukensmeyer, C. J., & Hasselblad-Torres, L. H. (2006). *Public deliberation: A manager's guide to citizen engagement*. Washington, DC: IBM Center for the Business of Government.

Lynam, T., De Jong, W., Sheil, D., Kusumanto, T., & Evans, K. (2007). A review of tools for incorporating community knowledge, preferences, and values into decision-making in natural resources management. *Ecology and Society*, *12*(1), 5. Retrieved from https://www.ecologyandsociety.org/vol12/iss1/art5/

Lynn, F. M., & Busenberg, G. J. (1995). Citizen advisory committees and environmental policy: What we know, what's left to discover. *Risk Analysis*, *15*(2), 147-162. doi:10.1111/j.1539-6924.1995.tb00309.x

Lynn, F. M., & Busenberg, G. J. (1995). Citizen advisory committees and environmental-policy: What we know, what's left to discover. *Risk Analysis*, *15*(2), 147-162. doi:10.1111/j.1539-6924.1995.tb00309.x

Lynn, F. M., & Kartez, J. D. (1995). The redemption of citizen advisory committees: A perspective from critical theory. In O. Renn, T. Webler, & P. Wiedemann (Eds.), *Fairness and competence in citizen participation: Evaluating models for environmental discourse*. Massachusetts, MT: Springer Science + Business Media Dordrecht.

Macintosh, A. (2004). Characterizing e-participation in policy-making. In *Proceedings of the 37th Annual Hawaii International Conference on System Sciences (HICSS-37): 5-8 January 2004*. Los Alamitos, CA: IEEE Computer Society Press.

Macintosh, A., & Whyte, A. (2008). Towards an evaluation framework for eParticipation. *Transforming Government: People, Process, and Policy*, *2*(1), 16-30. doi:10.1108/17506160810862928

Mackay, M. (2004). *A comparison of the sample survey and open house methods of public consultation for transportation issues in the city of Edmonton* (Master's thesis). Retrieved from ProQuest Dissertations & Theses Global.

MacNaughten, P., & Jacobs, M. (1997). Public identification with sustainable development: Investigating cultural barriers to participation. *Global Environmental Change: Human and Policy Dimensions*, *7*, 5-24.

Maier, K. (2001). Citizen participation in planning: Climbing a ladder? *European Planning Studies*, *9*(6), 707-719. doi:10.1080/713666506

Mancini, J., Nogues, C., Adenis, C., Berthet, P., Bonadona, V., Chompret, A., … Julian-Reynier, C. (2006). Patients' characteristics and rate of Internet use to obtain cancer information. *Journal of Public Health*, *28*(3), 235-237. doi:10.1093/pubmed/fdl019

Manfreda, K. L., Bosnjak, M., Berzelak, J., Haas, I., & Vehovar, V. (2008). Web surveys versus other survey modes: A meta-analysis comparing response rates. *International Journal of Market Research*, *50*(1), 79-104. doi:10.1177/147078530805000107

Mansourian, A., Taleai, M., & Fasihi, A. (2011). A web-based spatial decision support system to enhance public participation in urban planning processes. *Journal of Spatial Science*, *56*(2), 269-282. doi:10.1080/14498596.2011.623347

Margerum, R. D. (1999). Getting past yes: From capital creation to action. *Journal of the American Planning Association*, *65*(2), 181-192. doi:10.1080/01944369908976046

Markman, M., Markman, M. R., Belland, A., & Petersen, J. (2006). Profile of ovarian cancer patients seeking information from a web-based decision support program. *Journal of Women's Health*, *15*(3), 312-318. doi:10.1089/jwh.2006.15.312

Martin, A., & Sherington, J. (1997). Participatory research methods: Implementation, effectiveness and institutional context. *Agricultural Systems*, *55*(2), 195-216. doi:10.1016/s0308-521x(97)00007-3

Massam, B. H. (1993). *The right place: Shared responsibility and the location of public facilities*. London, UK: Longman Scientific & Technical.

Mattessich, P. W., Murray-Close, M., & Monsey, B. R. (2001). *Collaboration: What makes it work* (2nd ed.). Saint Paul, MN: Amhearst H. Wilder Foundation.

McAllister, D. M. (1980). Evaluation in environmental planning: Assessing environmental, social, economic and political trade-offs. In *Philosophy of democracy*. Massachussettes, MA: MIT Press.

McCall, M. K. (2003). Seeking good governance in participatory-GIS: A review of processes and governance dimensions in applying GIS to participatory spatial planning. *Habitat International*, *27*(4), 549-573. doi:10.1016/s0197-3975(03)00005-5

McCall, M. K., & Dunn, C. E. (2012). Geo-information tools for participatory spatial planning: Fulfilling the criteria for 'good' governance? *Geoforum*, *43*(1), 81-94. doi:10.1016/j.geoforum.2011.07.007

McCool, S. F., & Guthrie, K. (2001). Mapping the dimensions of successful public participation in messy natural resources management situations. *Society & Natural Resources*, *14*(4), 309-323. doi:10.1080/713847694

McGee, S. (2009). *Understanding best practices for community engagement in municipal context* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Middendorf, G., & Busch, L. (1997). Inquiry for the public good: Democratic participation in agricultural research. *Agriculture and Human Values*, *14*, 45-57.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *The Academy of Management Review*, *22*(4), 34. doi:10.2307/259247

Moffet, J. (1996). Environmental priority setting based on comparative risk and public input. *Canadian Public Administration*, *39*(3), 362-385. doi:10.1111/j.1754-7121.1996.tb00137.x

Mossberger, K., & Jimenez, B. (2009). *Can eGovernment promote civic engagement? A study of local government websites in Illinois and the U.S.* Institute for Policy and Civic Engagement.

Mossberger, K., Tolbert, C., & Stansbury, M. (2003). *Virtual inequality: Beyond the digital divide*. Washington, DC: Georgetown University Press.

Nabatchi, T. (2012). *A manager's guide to evaluating citizen participation*. Syracuse, NY: IBM Centre for the Business of Government.

National Center for Geographic Information & Analysis (NCGIA). (1996). *Summary report: GIS and society workshop*. Santa Barbara, Calif.: South Haven, MN, 2–5 March.

National Center for Geographic Information and Analysis (NCGIA). (1996). *Summary report: Public participation GIS workshop*. Orono, ME, 10–13 July, ME.

National Telecommunications and Information Administration (NTIA). (2000). *Falling through the net: Toward digital inclusion - A report on Americans' access to technology tools*. Retrieved from U.S. Department of Commerce, Economic and Statistics Administration website: http://www.ntia.doc.gov/ntiahome/digitaldivide/

Nelkin, D., & Pollak, M. (1979). Public participation in technological decisions: Reality or grand illusion? *Technology Review*, *9*, 55-64.

Nelson, J. G. (1982). Public participation in comprehensive resource and environmental management. *Science and Public Policy*, 240-250.

Nelson, N., & Wright, S. (1995). *Power and Participatory Development: Theory and practice*. London, UK: Intermediate Technology Publications.

Newig, J. (2007). Does public participation in environmental decisions lead to improved environmental quality? Towards an analytical framework. Communication, cooperation, participation. *Research and Practice for a Sustainable Future 1*, 51-71.

Ng, K. L., & Hamby, D. M. (1997). Fundamentals for establishing a risk communication program. *Health Physics*, *73*(3), 473-482. doi:10.1097/00004032-199709000-00005

Nielsen, J. (1993). *Usability engineering*. San Diego, CA: Morgan Kaufmann.

Niezen, A. (1987). *The efficiency and effectiveness of public involvement in multiple use issues in British Columbia*. Victoria, Canada: A professional report to the Association of British Columbia Provincial Foresters.

Norris, P. (2001). *Digital divide: Civic engagement, information, poverty, and the internet worldwide*. Cambridge, UK: Cambridge University Press.

Northern Forest Lands Council (NFLC). (1994). *Finding common ground: Conserving the Northern Forest*. Concord, NH: The Northern Forest Lands Council.

Nyerges, T. (2005). Scaling-up as a grand challenge for public participation. *GIS Directions Magazine*. Retrieved from http://www.directionsmag.com/entry/scaling-up-as-a-grand-challenge-for-publicparticipation-gis/123341 (accessed 30 December 2016)

Nyerges, T., & Aguirre, R. W. (2011). Public participation in analytic-deliberative decision making: Evaluating a large-group online field experiment. *Annals of the Association of American Geographers*, *101*(3), 561-586. doi:10.1080/00045608.2011.563669

Nyerges, T., Jankowski, P., & Drew, C. (2002). Data-gathering strategies for social-behavioural research about participatory geographical information system use. *International Journal of Geographical Information Science*, *16*(1), 1-22. doi:10.1080/13658810110075987

Obermeyer, N. (1998). The evolution of public participation GIS. *Cartography and Geographic Information Systems*, *25*(2), 56-66.

O'Connor, R., Schwartz, M., Schaad, J., & Boyd, D. (2000). *State of the Practice: White Paper on Public Involvement*. Retrieved from Committee on Public Involvement in Transportation, Transportation Research Board: National Research Council, Washington, D.C. website: http://www.des.ucdavis.edu/faculty/handy/TTP220/PI_white_paper.pdf

O'Donoghue, T. A., & Punch, K. (2003). *Qualitative educational research in action: Doing and reflecting*. London, UK: Routledge.

OECD. (2004). *Stakeholder involvement techniques: A short guide and annotated bibliography*. Retrieved from A report from Nuclear Energy Agency Forum for Stakeholder Confidence website: http://www.nea.fr/html/rwm/reports/2004/nea5418-stakeholder.pdf

Okali, C., Sumberg, J. E., & Farrington, J. (1994). *Farmer participatory research: Rhetoric and reality*. London, UK: Overseas Development Institute.

Olsen, S. B. (2009). Choosing between Internet and mail survey modes for choice experiment surveys considering non-market goods. *Environmental and Resource Economics*, *44*(4), 591-610. doi:10.1007/s10640-009-9303-7

Open Government Data - OECD. (n.d.). Retrieved from http://www.oecd.org/gov/digital-government/open-government-data.htm

Openshaw, S. (1991). A view on the GIS crisis in geography, or, using GIS to put Humpty-Dumpty back together again. *Environment and Planning A*, *23*(5), 621-628. doi:10.1068/a230621

O'Meara, P. (2004). Outside - Looking In: evaluating a community capacity building project. *Rural Society*, *14*(2), 126-141.

Pahl-Wostl, C., & Hare, M. (2004). Processes of social learning in integrated resources management. *Journal of Community and Applied Social Psychology*, *14*(3), 193-206. doi:10.1002/casp.774

Pain, R., & Francis, P. (2003). Reflections on participatory research. *Area*, *35*(1), 46-54.

Parenteau, R. (1988). *Public participation in environmental decision-making*. Ottawa, Canada: Federal Environmental Assessment Review Office.

Peng, Z. (1999). An assessment framework for the development of Internet GIS. *Environment and Planning B: Planning and Design*, *26*(1), 117-132. doi:10.1068/b260117

Peng, Z. (2001). Internet GIS for public participation. *Environment and Planning B: Planning and Design*, *28*, 889-905.

Perez-Tornero, J. M. (2004). A new morel for promoting digital literacy. Retrieved from http://ec.europa.eu/education/archive/elearning/doc/workshops/Digital_literacy/position_papers/perez_tornero_jose.pdf

Peterman, W. (2000). *Neighborhood planning and community-based development: The potential and limits of grassroots action*. Thousand Oaks, CA: Sage.

Peterson, M. W., & Fretz, P. C. (2003). Patient use of the Internet for information in a lung cancer clinic. *Chest*, *123*(2), 452-457. doi:10.1378/chest.123.2.452

Petts, J. (1995). Waste management strategy development: A case study of community involvement and consensus-building in Hampshire. *Journal of Environmental Planning and Management*, *38*(4), 519-536. doi:10.1080/09640569512797

Phillipson, J., & Liddon, A. (2007). Common knowledge? An exploration of knowledge transfer. *Rural Economy and Land Use Programme: Briefing Series*, *6*. Retrieved from http://www.relu.ac.uk/news/briefings/RELUBrief6%20Common%20Knowledge.pdf

Pina, V., Torres, L., & Royo, S. (2007). Are ICTs improving transparency and accountability in the EU regional and local governments? An empirical study. *Public Administration*, *85*(2), 449-472. doi:10.1111/j.1467-9299.2007.00654.x

Piovesan, F. (2015). *Beyond standards and regulations: Obstacles to open government data initiatives in Italy and France* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Plewe, B. (1997). *GIS online: Information retrieves, mapping, and the Internet*. Santa Fe, NM: WordPress.

Pocewicz, A., Nielsen-Pincus, M., Brown, G., & Schnitzer, R. (2012). Evaluation of Internet versus paper-based methods for public participation geographic information systems (PPGIS). *Transactions in GIS*, *16*(1), 39-53. doi:10.1111/j.1467-9671.2011.01287.x

Praxis Consulting. (1988). *Public involvement: Planning and implementing public involvement programs*. Calgary, Canada: Unpublished report prepared for Departmental agencies of the Canadian government.

Preece, J., Rogers, Y., Sharp, H., Beyon, D., Holland, S., & Carey, T. (1994). *Human-computer interaction*. Harlow, UK: Addison-Wesley.

Prell, C., Hubacek, K., Reed, M. S., Burt, T. P., Holden, J., Jin, N., … Termansen, M. (2007). If you have a hammer, everything looks like a nail: 'Traditional' versus participatory model building. *Interdisciplinary Science*, *32*, 1-20. doi:10.1016/j.arthro.2017.03.001

Pretty, J. N. (1995). Participatory learning for sustainable agriculture. *World Development*, *23*(8), 1247-1263. Retrieved from doi.org/10.1016/0305-750X(95)00046-F

Public participation guide: Introduction to public participation. (2018, February 22). Retrieved May 16, 2017, from https://www.epa.gov/international-cooperation/public-participation-guide-introduction-public-participation

Public participation guide: Process planning. (2018, February 22). Retrieved October 19, 2017, from https://www.epa.gov/international-cooperation/public-participation-guide-process-planning

Public participation guide: Selecting the right level of public participation. (2018, February 22). Retrieved March 15, 2017, from https://www.epa.gov/international-cooperation/public-participation-guide-selecting-right-level-public-participation

Public. (2018, March 16). Retrieved March 30, 2017, from https://en.wikipedia.org/wiki/Public

Putnam, R. (2000). *Bowling alone*. New York, NY: Simon & Schuster.

Putnam, R. D. (1993). The prosperous community: Social capital and public life. *American Prospect*, *13*, 35-42.

Putnam-Walkerly, K., & Russell, E. (2016, September 15). *What the heck does "Equity" mean?*. Retrieved from https://ssir.org/articles/entry/what_the_heck_does_equity_mean

Q methodology. (2017, April 1). Retrieved August 18, 2017, from https://en.wikipedia.org/wiki/Q_methodology

Quick, K. S., & Bryson, J. (2016). Theories of public participation in governance. In J. Torbing & C. Ansell (Eds.), *Handbook of theories of governance*. Northampton, MA: Edward Elgar.

Ragnedda, M., & Muschert, G. W. (Eds.). (2013). *The digital divide: The internet and social inequality in international perspective*. London, UK: Routledge.

Rahl, G. M. (1996). Risk reduction through public-participation in environmental decisions. *Naval Engineers Journal*, *108*(4), 53-57. doi:10.1111/j.1559-3584.1996.tb02895.x

Ramasubramanian, L. (2000). *Knowledge production and use in community-based organizations: Examining the impacts and influence of information technologies* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Ramasubramanian, L. (2008). *Geographic information science and public participation*. Heidelberg, Germany: Springer.

Ramasubramanian, L. (2011). Public participation GIS implementation and the transformation of US planning practice. In T. L. In Nyerges, R. McMaster, & H. Couclelis (Eds.), *Handbook of GIS and society* (pp. 400-422). London, UK: Sage.

Ramasubramanian, L., & Quinn, A. (2004, July). *Participatory GIScience: Progress or illusion*. Paper presented at URISA Public Participation GIS Conference, Madison, WI. Retrieved from http://www.urisa.org/prev/PPGIS/2004/Prelim/absMonday.htm

Rantanen, H., & Kahila, M. (2009). The SoftGIS approach to local knowledge. *Journal of Environmental Management*, *90*(6), 1981-1990. doi:10.1016/j.jenvman.2007.08.025

Rappaport, J. (1984). Studies in empowerment: Introduction to the issue. *Prevention in Human Services*, *3*, 1-7.

Reddick, A. (2000). *The dual digital divide: The information highway in Canada*. Retrieved from Public Interest Advocacy Centre website: http://olt-bta.hrdc-drhc.gc.ca/publicat/index.html

Reed, M., & Dougill, A. (2010). Linking degradation assessment to sustainable land management: A decision support system for Kalahari pastoralists. *Journal of Arid Environments*, *74*(1), 149-155. doi:10.1016/j.jaridenv.2009.06.016

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation*, *141*(10), 2417-2431. doi:10.1016/j.biocon.2008.07.014

Reed, M. S., Dougill, A. J., & Baker, T. R. (2008). Participatory indicator development: What can ecologists and local communities learn from each other? *Ecological Applications*, *18*(5), 1253-1269. doi:10.1890/07-0519.1

Reed, M. S., Fraser, E. D., & Dougill, A. J. (2006). An adaptive learning process for developing and applying sustainability indicators with local communities. *Ecological Economics*, *59*(4), 406-418. doi:10.1016/j.ecolecon.2005.11.008

Reed, M. S., Graves, A., Posthumus, H., Hubacek, K., Morris, J., Norman, D., … Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management*, *90*(5), 1933-1949.

Renn, O., Webler, T., & Wiedemann, P. M. (1995). *Fairness and competence in citizen participation: Evaluating models for environmental discourse*. Dordrecht, Netherlands: Kluwer Academic.

Richards, C., Blackstock, K., & Carter, C. (2004). *Practical approaches to participation: SERG policy brief No. 1* (2nd ed.). Aberdeen, UK: Macauley Land Use Research Institute.

Rietbergen-McCracken, J., & Narayan-Parker, D. (1998). *Participatory tools and techniques: A resource kit for participation and social assessment*. Washington, DC: International Bank for Reconstruction and Development/World Bank.

Riggs, F. W. (2000, June). *Exporting governance?* Paper presented at Association for law and administration in developing and transitional countries (ALADIN) Forum, Leiden, Hawaii. Retrieved from http://www2.hawaii.edu/-fredr/aladin

Rinner, C. (1999). *Argumentation maps: GIS-based discussion support for online planning* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Rinner, C. (2001). Argumentation maps: GIS-based discussion support for on-line planning. *Environment and Planning B: Planning and Design*, *28*(6), 847-863. doi:10.1068/b2748t

Rinner, C., & Bird, M. (2009). Evaluating community engagement through argumentation maps: A public participation GIS case study. *Environment and Planning B: Planning and Design*, *36*(4), 588-601. doi:10.1068/b34084

Rittel, H. (1972). On the planning crisis: Systems analysis of the first and second generations. *Thinking Design (Bedriftsokonomen)*, *8*, 390-396. doi:10.1515/9783038210665.39

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*, 155-159. doi:10.5040/9781474282932.0015

Roberts, N. (2004). Public deliberation in an age of direct citizen participation. *The American Review of Public Administration*, *34*(4), 315-353. doi:10.1177/0275074004269288

Robinson, J. P., Kestnbaum, M., Neustadtl, A., & Alvarez, A. (2000). Mass media use and social life among Internet users. *Social Science Computer Review*, *18*(4), 490-501. doi:10.1177/089443930001800411

Rohe, W. M., & Gates, L. B. (1985). *Planning with neighborhoods*. Chapel Hill, NC: University of North Carolina Press.

The role of e-government and public participation in the planning process. (2002). In R. Kingston (Ed.), *XVI AESOP Congress: Planning in border regions*. Volos, Greece: the University of Thessaly, Department of Planning and Regional Development.

Rossi, P. H., & Freeman, H. E. (1993). *Evaluation: A systematic approach*. Newbury Park, CA: Sage.

Rowe, G., & Frewer, L. J. (2000). Public participation methods: A framework for evaluation. *Science, Technology, & Human Values*, *25*(1), 3-29. doi:10.1177/016224390002500101

Rowe, G., & Frewer, L. J. (2004). Evaluating public-participation exercises: A research agenda. *Science, Technology, & Human Values*, *29*(4), 512-556. doi:10.1177/0162243903259197

Rowe, G., & Frewer, L. J. (2005). A typology of public engagement mechanisms. *Science, Technology, & Human Values*, *30*(2), 251-290. doi:10.1177/0162243904271724

Rowe, G., Marsh, R., & Frewer, L. J. (2004). Evaluation of a deliberative conference. *Science, Technology, & Human Values*, *29*(1), 88-121. doi:10.1177/016224390002500101

Ruscio, K. P. (1996). Trust, democracy, and public management: A theoretical argument. *Journal of Public Administration Research and Theory*, *6*(3), 461-477. doi:10.1093/oxfordjournals.jpart.a024321

Sabatier, P. A. (2005). *Swimming upstream: Collaborative approaches to watershed management*. Cambridge, MA: MIT Press.

Sadagopan, G. D. (2000). *Web-based geographic information systems: Public participation in a virtual decision-making environment* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Sadler, B. (1978). Basic issues in public participation: A background perspective. In B. Sadler (Ed.), *Involvement and environment: Proceedings of the Canadian Conference on Public Participation*. Calgary, Canada: Environment Council of Alberta.

Sandman, P. M. (1993). *Responding to community outrage: Strategies for effective risk communication*. Fairfax, VA: American Industrial Hygiene Association.

Sanoff, H. (2000). *Community participation methods in design and planning*. New York, NY: J. Wiley & Sons.

Sarvasova, Z., Dobsinska, Z., & Salka, J. (2014). Public participation in sustainable forestry: The case of forest planning in Slovakia. *iForest - Biogeosciences and Forestry*, *7*(6), 414-422. doi:10.3832/ifor1174-007

Scherer, S., & Wimmer, M. A. (2012). E-participation and enterprise architecture frameworks: An analysis. *Information Polity*, *17*, 147-161. doi:10.1145/2037556.2037571

Schlossberg, M., & Mattia, M. (2003). When GIS was rejected: Implications for collaborative planning and public participation GIS (PPGIS). *Planning, Public Policy, and Management*, 1-15. Retrieved from http://www.iapad.org/wp-content/uploads/2015/07/schlossberg_rejecting_gis.pdf

Schlossberg, M., & Shuford, E. (2005). Delineating "Public" and "Participation" in PPGIS. *Journal of the Urban and Regional Information Systems Association (URISA)*, *16*(2), 15-26.

Schmitt, E., & Brassel, K. (1996). From GIS for control to GIS for creative exploration. In *GIS and society workshop: Specialist meeting report*. South Haven, CA.

Schmitter, P. C. (2005). The ambiguous virtues of accountability. In L. Diamond & L. Morlino (Eds.), *Assessing the quality of democracy* (pp. 18-31). Baltimore, MD: The John Hopkins University Press.

Schreiber, R., Crooks, D., & Stern, P. N. (1997). Qualitative meta-analysis. In J. M. Morse (Ed.), *Completing a qualitative project* (pp. 311-326). Thousand Oaks, CA: Sage.

Schroeder, P. (1996, March 7). *Criteria for the design of a GIS/2*. Retrieved from http://www.commoncoordinates.com/ppgis/criteria.html

Schroeder, P. (1996). *Report on public participation GIS workshop*. Retrieved from http://www.commoncoordinates.com/ppgis/public.html

Schroeder, P. C. (1997). *GIS in public participation settings*. Paper presented at University consortium for geographic information science (UCGIS): Annual assembly and summer retreat.

Schuurman, N. (1999). Critical GIS: Theorizing an emerging discipline. *Cartographica*, *36*(4), 7-10.

Sewell, W. R., & Coppock, J. T. (1977). *Public participation in planning*. London, UK: Wiley.

Sheppard, E. (1995). GIS and Society: Towards a research agenda. *Cartography and Geographic Information Systems*, *22*(1), 5-16. doi:10.1559/152304095782540555

Shipley, R., & Utz, S. (2012). Making it count: A review of the value and techniques for public consultation. *Journal of Planning Literature*, *27*(1), 22-42. doi:10.1177/0885412211413133

Sidlar, C., & Rinner, C. (2007). Analyzing the usability of an argumentation map as a participatory spatial decision support tool. *URISA Journal*, *19*(1), 47-55.

Sieber, R. (2006). Public participation geographic information systems: A literature review and framework. *Annals of the Association of American Geographers*, *96*(3), 491-507.

Sieber, R. E., Robinson, P. J., Johnson, P. A., & Corbett, J. M. (2016). Doing public participation on the geospatial web. *Annals of the Association of American Geographers*, *106*(5), 1030-1046.

Skelcher, C., Mathur, N., & Smith, M. (2005). The public governance of collaborative spaces: Discourse, design, and democracy. *Public Administration*, *83*(3), 573-596. doi:10.1111/j.0033-3298.2005.00463.x

Skinner, H., Biscope, S., & Poland, B. (2003). Quality of internet access: barrier behind internet use statistics. *Social Science & Medicine*, *57*(5), 875-880. doi:10.1016/s0277-9536(02)00455-0

Smith, L. G. (1982). Alternative mechanisms for public participation in environmental policy-making. *Environments*, *14*(3), 21-34.

Smith, L. G. (1984). Public participation in policy making: The state-of-art in Canada. *Geoforum*, *15*(2), 253-259.

Smith, L. G. (1993). *Impact assessment and sustainable resource management*. Harlow, UK: Longman.

Smith, L. G., Nell, C. Y., & Prystupa, M. V. (1997). The converging dynamics of interest representation in resources management. *Environmental Management*, *21*(2), 139-146. doi:10.1007/s002679900013

Smith, P. D., & McDonough, M. H. (2001). Beyond public participation: Fairness in natural resource decision-making. *Society & Natural Resources*, *14*(3), 239-249. doi:10.1080/08941920120140

Snook, K., & Mongiat, M. (2010, July 26). *What is good Participation?*. Retrieved from http://goodparticipation.com/what-is-good-participation-2/

Social exchange theory. (2018, February 28). Retrieved from https://en.wikipedia.org/wiki/Social_exchange_theory

Soriani, S., Buono, F., Tonino, M., & Camuffo, M. (2015). *How to improve the efficiency of public participation processes in coastal management*. Retrieved from http://ec.europa.eu/environment/integration/research/newsalert/pdf/how_to_improve_the_efficiency_of_public_participation_processes_in_coastal_management_417na6_en.pdf

Spatial decision support system. (2017, July 25). Retrieved September 2017, from https://en.wikipedia.org/wiki/Spatial_decision_support_system

Sproull, L. S., & Kiesler, S. B. (1991). *Connections*. Cambridge, MA: MIT Press.

Stanbury, W. T., & Fulton, M. J. (1988, April). *Consultation and public participation processes in government policy-making: A conceptual framework*. Paper presented at Conference on Consultation Process in Business-Government Relations, max Bell Centre for Business-Government Studies, York University.

Steinmann, R., Krek, A., & Blaschke, T. (2004). Analysis of online public participatory GIS applications with respect to the differences between the US and Europe. In *Proceedings of the 24th Urban*

Data Management Symposium. Retrieved from http://www.salzburgresearch.at/research/gfx/udms%20paper2004last.pdf

Stern, E., Gudes, O., & Svoray, T. (2009). Web-based and traditional public participation in comprehensive planning: A comparative study. *Environment and Planning B: Planning and Design*, *36*(6), 1067-1085. doi:10.1068/b34113

Stirling, A. (2008). "Opening up" and "Closing down": Power, participation, and pluralism in the social appraisal of technology. *Science, Technology, & Human Values*, *33*(2), 262-294. doi:10.1177/0162243907311265

Stolte, J. F., & Emerson, R. M. (1977). Structural inequality: Position and power in network structures. In R. Hamblin & J. Kunkel (Eds.), *Behavioral theory in sociology*. New Brunswick, Canada: Transaction Press.

Straus, D. (1999). Designing a consensus-building process using a graphic road map. In L. S. Susskind, S. McKernanan, & J. Thomas-Larmer (Eds.), *The consensus-building handbook: A comprehensive guide to reaching an agreement* (pp. 137-167). Thousand Oaks, CA: Sage Publications.

Straus, D. (1999). A short guide to consensus building. In L. Susskind, S. McKearnan, & J. Thomas-Larmer (Eds.), *The consensus building handbook: A comprehensive guide to reaching an agreement* (pp. 2-57). Thousand Oaks, CA: Sage Publications.

Stringer, L. C., Prell, C., Reed, M. S., Hubacek, K., Fraser, E. D., & Dougill, A. J. (2006). Unpacking 'participation' in the adaptive management of socio-ecological systems: A critical review. *Ecology and Society*, *11*(2), 39. doi:10.5751/es-01896-110239

Sultana, P., & Abeyasekera, S. (2008). The effectiveness of participatory planning for community management of fisheries in Bangladesh. *Journal of Environmental Management*, *86*(1), 201-213. doi:10.1016/j.jenvman.2006.12.027

Surowiecki, J. (2004). *The wisdom of crowds*. New York, NY: Anchor Books.

Susskind, L., & Cruikshank, J. (1987). *Breaking the impasse: Consensual approaches to resolving public disputes*. New York, NY: Basic Books.

Susskind, L., Van der Vansem, M., & Ciccarelli, A. (2000). *Mediating land use disputes: Pros and cons*. Cambridge, MA: Lincoln Institute of Land Policy.

Sweeney, M., Maguire, M., & Shackel, B. (1993). Evaluating user-computer interaction: A framework. *International Journal of Man-Machine Studies*, *38*, 698-711.

Tang, K. X., & Waters, N. M. (2005). The internet, GIS and public participation in transportation planning. *Progress in Planning*, *64*(1), 7-62. doi:10.1016/j.progress.2005.03.004

Tang, M. Y. (2006). *Design and implementation of a GIS-enabled online discussion forum for participatory planning* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Tang, T., Zhao, J., & Coleman, D. J. (2005). *Design of a GIS-enabled online discussion forum for participatory planning*. Paper presented at Proceedings of the 4th Annual Public Participation GIS Conference, Cleveland, Ohio.

Tang, Z., & Liu, T. (2016). Evaluating Internet-based public participation GIS (PPGIS) and volunteered geographic information (VGI) in environmental planning and management. *Journal of Environmental Planning and Management*, *59*(6), 1073-1090. doi:10.1080/09640568.2015.1054477

Taylor, P. J., & Overton, M. (1992). Further thoughts on geography and GIS: A reply. *Environment and Planning*, *24*, 463-466.

Thomas, J. C. (1990). Public involvement in public management: adapting and testing a borrowed theory. *Public Administration Review*, *50*(4), 435-445.

Thomas, J. C. (1995). *Public participation in public decisions: New skills and strategies for public managers*. San Francisco: Jossey-Bass Publishers.

Thompson, A. R. (1980). A disciplined framework for public participation. In B. Sadler (Ed.), *Public participation in environmental decision-making: strategies for change* (pp. 15-30). Calgary, Canada: Environment Council of Alberta.

Timulak, L. (2009). Meta-analysis of qualitative studies: A tool for reviewing qualitative research findings in psychotherapy. *Psychotherapy Research*, *19*(4-5), 591-600. doi:10.1080/10503300802477989

Tippett, J., Handley, J. F., & Ravetz, J. (2007). Meeting the challenges of sustainable development: A conceptual appraisal of a new methodology for participatory ecological planning. *Progress in Planning*, *67*(1), 9-98. doi:10.1016/j.progress.2006.12.004

Trevett-Smith, M. D. (2009). *Local area network: Community involvement, social capital, and Glocalization at NetU* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database.

Triangulation (social science). (2018, February 27). Retrieved from https://en.wikipedia.org/wiki/Triangulation_%28social_science%29

Tripp, C. (2007). *Evaluation of a public participatory GIS tool within a public planning case study* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Tsai, B. W., Lu, D. J., Chung, M. K., & Lien, M. (2012). Evaluation of PPGIS empowerment: A case study of Meinong Yellow Butterfly Valley in Taiwan. *Journal of Environmental Management*, *116*, 204-212. doi:10.1016/j.jenvman.2012.12.005

Tulloch, D. (2003). *What PPGIS really need is …* Paper presented at The 2nd Annual Conference on PPGIS, Portland, Oregon.

Tulloch, D. (2008). Public participation GIS (PPGIS). In K. K. Kemp (Ed.), *Encyclopedia of geographic information science* (pp. 352-354). Thousands of Oaks, CA: SAGE Publications.

Tulloch, D., & Shapiro, T. (2003). The intersection of data access and public participation: Impacting GIS users' success? *Journal of the Urban and Regional Information Systems Association (URISA)*, *15*, 55-60. Retrieved from http://www.urisa.org/Journal/APANo2/Tulloch.pdf

Turkucu, A. (2008). *Development of a conceptual framework for the analysis and the classification of "Public Participation GIS"* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Turner, M., & Weninger, Q. (2005). Meetings with costly participation: An empirical analysis. *Review of Economic Studies*, *72*(1), 247-268. doi:10.1111/0034-6527.00331

Twight, B. W., & Carroll. (1983). Workshops in public involvement: Do they help find common ground? *Journal of Forestry*, *81*, 732-735.

Twitchen, C., & Adams, D. (2011). Increasing levels of public participation in planning using web 2.0 technology. *Centre for Environment and Society Research: Working Paper Series*, *5*.

U.S. Environmental Protection Agency (EPA). (2010). *Open government plan1.0*. Retrieved from http://nebula.wsimg.com/684c526f5fbdd2f7a87d685a4aa79a7f?AccessKeyId=32D3073064A275D49DFF&disposition=0&alloworigin=1

UNDP. (1997). *Defining core characteristics of good governance*. New York, NY: United Nations Development Programme: Management Development and Governance Division.

United Nations Conference on Environment and Development (UNCED). (1992). *Nations of the earth report: National reports summaries*. Geneva: UNCED.

Van Dijk, J. A. (2005). *The deepening divide: Inequality in the information society*. Thousand Oaks, CA: Sage Publications.

Van Dijk, J. A., & Van Deursen, A. J. (2014). *Digital skills: Unlocking the information society*. New York, NY: Palgrave Macmillan.

Van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The Information Society*, *19*(4), 315-326. doi:10.1080/01972240309487

Van Kersbergen, K., & Van Waarden, F. (2001). *Shifts in governance: Problems of legitimacy and accountability*. The Hague: MAGW (Social Science Research Council), for: NWO (Netherlands Organization for Scientific Research) Strategic Plan.

Van Tatenhove, J. P., & Leroy, P. (2003). Environment and participation in a context of political modernisation. *Environmental Values*, *12*(2), 155-174. doi:10.3197/096327103129341270

Vasquez, G. M., & Taylor, M. (2001). Research perspectives on "the public." In R. Lawrence & G. M. Vasquez (Eds.), *Health: Handbook of public relations*. SAGE.

Vaughan, E. (1993). Individual and cultural differences in adaptation to environmental risks. *American Psychologist*, *48*(6), 673-680. doi:10.1037//0003-066x.48.6.673

Ventura, S. J., Niemann, B. J., Sutphin, T. L., & Chenoweth, R. E. (2002). GIS-enhanced land use planning. In W. J. Craig, T. M. Harris, & D. Weiner (Eds.), *Community participation and geographic information systems* (pp. 113-124). London, UK: Taylor & Francis.

Voss, A., Denisovich, I., Gatalsky, P., Gavouchidis, K., Klotz, A., Roeder, S., & Voss, H. (2004). Evolution of a participatory GIS. *Computers, Environment and Urban Systems*, *28*, 635-651.

Wallerstein, N. (1999). Power between evaluator and community: Research relationships within New Mexico's healthier communities. *Social Science & Medicine*, *49*(1), 39-53. doi:10.1016/s0277-9536(99)00073-8

Warner, M. (1997). 'Consensus' participation: An example of protected areas planning. *Public Administration and Development*, *17*(4), 413-432. doi:10.1002/(sici)1099-162x(199710)17:43.3.co;2-g

Weber, L. M., Loumakis, A., & Bergman, J. (2003). Who participates and why? An analysis of citizens on the Internet and the mass public. *Social Science Computer Review*, *21*(1), 26-42. doi:10.1177/0894439302238969

Webler, T. (1995). "Right" discourse in citizen participation: An evaluative yardstick. In O. Renn, T. Webler, & P. Wiedemann (Eds.), *Fairness and competence in citizen participation: Evaluating models for environmental discourse* (pp. 35-86). Dordrecht, The Netherlands: Kluwer Academic.

Webler, T. (1999). The craft and theory of public participation: A dialectical process. *Journal of Risk Research*, *2*(1), 55-71. doi:10.1080/136698799376989

Webler, T., & Tuler, S. (2000). Fairness and competence in citizen participation: Theoretical reflections from a case study. *Administration & Society*, *32*(5), 566-595. doi:10.1177/00953990022019588

Webler, T., & Tuler, S. (2001). Public participation in watershed management planning: Views on the process from people in the field. *Human Ecology Review*, *8*(2), 29-39.

Webler, T., Tuler, S., & Krueger, R. (2001). What is a good public participation process? Five perspectives from the public. *Environmental Management*, *27*(3), 435-450. doi:10.1007/s002670010160

Webler, T., & Tuler, S. (2006). Four perspectives on public participation process in environmental assessment and decision-making: Combined results from 10 case studies. *Policy Studies Journal*, *34*(4), 699-722. doi:10.1111/j.1541-0072.2006.00198.x

Weiner, D., Harris, T. M., & Craig, W. J. (2002). *Community participation and geographic information systems*. NY, NY: Taylor & Francis.

Wellman, B., & Haythornthwaite, C. (Eds.). (2002). *The Internet in everyday life*. Oxford, UK: Blackwell.

Wellman, B. (1999). The network community. In B. Wellman (Ed.), *Networks in the global village*. Boulder, CO: Westview.

Wellman, B. (2001). Physical place and cyber-place. *International Journal for Urban and Regional Research*, *25*, 227-252.

Wellman, B., Haase, A. Q., Witte, J., & Hampton, K. (2001). Does the Internet Increase, Decrease, or Supplement Social Capital? *American Behavioral Scientist*, *45*(3), 436-455. doi:10.1177/00027640121957286

Westholm, H. (2008). *End-of-project evaluation of the internet III B project EVOICE*. Retrieved from Bremen website: http://www.ifib.de/publikationsdateien/EVOICE_end-of-project_evaluation_report_fin..pdf

Wickson, F., Delgado, A., & Kjølberg, K. L. (2010). Who or what is 'the public'? *Nature Nanotechnology*, *5*, 757-758.

Wiedemann, P. M., & Femers, S. (1993). Public participation in waste management decision making: Analysis and management of conflicts. *Journal of Hazardous Materials*, *33*(3), 355-368. doi:10.1016/0304-3894(93)85085-s

Willeke, G. E. (1974). *Identification of publics in water resources planning*. Atlanta, GA: Georgia Institute of Technology, Department of City Planning.

Williams, P., Nicholas, D., & Huntington, P. (2003). Non use of health information kiosks examined in information needs context. *Health Information and Libraries Journal*, *20*(2), 95-103. doi:10.1046/j.1471-1842.2003.00428.x

Wilson, C. (2010, December 12). *Finding the middle ground in a spectrum of collaboration*. Retrieved from http://www.christopherwilson.ca/papers/Finding_the_Middle_Ground_in_a_Spectrum_of_Collaboration.pdf

Witte, J., Kiss, M., & Lynn, R. (2013). The Internet and social inequalities in the U.S. In M. Ragnedda & G. W. Muschert (Eds.), *The digital divide: The internet and social inequality in international perspective* (pp. 67-84). Abingdon, UK: Routledge.

Wondolleck, J. M., & Yaffee, S. L. (2000). *Making collaboration work: Lessons from innovation in natural resource management*. Washington, DC: Island Press.

Wood, J. (2005). 'How green is my valley?' Desktop geographic information systems as a community-based participatory mapping tool. *Area*, *37*(2), 159-170. doi:10.1111/j.1475-4762.2005.00618.x

Woolcock, M., & Brown, V. (2005). *Principles of community engagement: From the literature on natural resources management, local community development, human services, and sustainability*. Retrieved from http://wvvrw.uq.edu.au/boilerhouse/docs/WoolcockBrovm2005.pdf

World Bank. (1994). *Report of the learning group on participatory development: Third draft*. Washington, DC: The World Bank.

Wuthnow, R. (1991). *Acts of compassion: Caring for others and helping ourselves*. Princeton, NJ: Princeton University Press.

Zhao, J. (2007). *An empirical usability evaluation of a Web-based Public Participation Geographic Information System and discussion forum* (Master's thesis). Retrieved from ProQuest Dissertations and Theses database.

Zimmerman, M. A. (2000). Empowerment theory: Psychological, organizational, and community levels of analysis. In J. Rappaport & E. Seidman (Eds.), *Handbook of community psychology*. New York, NY: Kluwer Academic/Plenum Publishers.