

Participatory Urban Planning – introducing a 2D/3D Visualization and AHP framework

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Abstract

Participation in urban planning is important to increase accountability, transparency, and legitimacy of decisions. In this context, it is essential to establish the needs and priorities of stakeholders potentially affected by decisions. However, poor participation practices undermine the public's trust in decision-making processes and reduce the public's willingness to participate. The study aims to contribute to urban planning theory by discussing what participatory planning means. Furthermore, a systematic, objective-led and negotiation-based decision support framework is proposed, based on a 2D/3D visualisation and AHP (Analytic Hierarchy Process) for use in participatory urban planning. The framework aims to increase legitimacy of decisions taken without ignoring the political dimension of planning. It was tested in a regeneration case study in Liverpool (UK). Testing shows that the framework enables technical issues to be addressed in a way that the public can understand. A systematic evaluation of participants' priorities is possible, and negotiated participation is supported. The framework could support the transfer of stakeholders' priorities into plan decisions with online meetings and surveys, for example when the possibility of physical meetings is restricted.

Keywords: Participatory planning, participation, decision-making, 2D/3D visualisation, AHP

1. Introduction

A key aim of urban planning is to establish urban policies for the future (Levend & Erdem, 2017). In this context, it is not only the responsible authority and other experts coming together but also various interest groups, including the general public. Procedural steps in urban planning include the evaluation of the current situation and the anticipation of future decisions and associated possible impacts. Participatory planning approaches allow interested parties to participate actively in decision-making, share experiences and expectations, and form shared visions (Healey, 1998a; Fischer, 2003; Ataöv, 2013). High-quality-of-life cities accommodate citizens' wishes regarding their social, environmental, economic, and cultural needs (Geray, 1998). Within this context, administrators, authorities as well as community leaders have come to accept the value of public participation in public decision processes (Bryson et al., 2013; Berntzen & Johannessen, 2016). Participatory spatial planning supports transparent and accountable decision-making that respects local discourses and values (Muthoora and Fischer, 2019).

While participation in public decision processes is a legal requirement in many countries (Innes & Booher, 2000; Creighton, 2005), it has been suggested that on many occasions this is neither effective nor efficiently handled (Healey, 1992). Associated challenges have been said to include (Innes & Booher, 1999; Innes & Booher, 2000; Irvin & Stansbury, 2004; Involve, 2005; Ataöv, 2007b; NRC, 2008; Laurian & Shaw, 2009; Ataöv, 2013):

- Application of unsuitable methods causing distrust amongst participants.
- Participation is seen as a fulfilment of legal obligations only.
- Insufficient time is given to participants, leading to frustration and reduced enthusiasm
- Dominant interests dominate debates.
- Participation being perceived as delaying planning processes.

If participants cannot express themselves and decisions are made mainly in line with dominating parties' interests, participation is perceived as a ritual designed to meet legal requirements. Decision-making situations in which technical aspects are expressed in a way that the public can understand them and where participants' ideas are systematically assessed (e.g. through impact

assessment; see Fischer, 2007) can help address issues of power and mistrust (Innes & Booher, 2004; Creighton, 2005; Nadeem and Fischer, 2011).

In this paper, we propose a systematic and negotiation-based decision support framework, based on 2D/3D visualisations, and AHP (Analytic Hierarchy Process) approaches. The aim is to address the challenges discussed above. The approach is meant to enable the use of local information, negotiation and social learning. First, what participatory planning means is elaborated on. Then, the 2D/3D visualisation and AHP-based framework are introduced. Next, results from a case study where the framework was applied are presented. Finally, advantages and shortcomings of the proposed framework are established.

2. Participatory Planning

Rational planning was the central paradigm for much of the twentieth century (Ataöv, 2007a). However, after 1980, participatory planning approaches, promising more democratic and negotiation-based processes, were advocated as they were seen as being able to support urban space according to people's preferences, applying the principles of transparency, accountability and decentralisation (Healey, 1996; Healey, 1998a; Ataöv, 2008; Blondet et al., 2017).

Participatory planning is based on a normative assumption that it is not just authority and other experts but also people affected by decisions that should have a say in decision-making. Participation means bringing people from different social groups together, exchanging information and producing more consensus-based, collective decisions (Creighton, 2005; Ataöv, 2007b; Michels & De Graaf, 2010; Berntzen & Johannessen, 2016; Kovács et al., 2017). The public will get to know technical and specialist issues that underlie decisions. Participation provides learning opportunities, enabling local knowledge production (Healey, 1998b; Friedmann, 1998; Ataöv, 2008; Ehn, 2008; NRC, 2008; Fischer et al, 2009; Boroushaki & Malczewski, 2010; Ataöv, 2013).

In a participatory process, mutual interaction and collective knowledge generation of stakeholders generate trust and help stakeholders to understand each other. A fair and open involvement of stakeholders (i.e. one in which no manipulation is attempted; see Fischer, 2016) can increase the quality of decisions. People who are allowed to participate in decision-making processes feel that they are a part of society, making them more prepared to embrace transparent and balanced

decisions thus made (Innes & Booher, 1999; Innes & Booher, 2004; Irvin & Stansbury, 2004; Creighton, 2005; Aksakoğlu, 2007; Ataöv, 2007b; Boroushaki & Malczewski, 2010; Ataöv, 2013; Berntzen & Johannessen, 2016). Participation thus increases the public consciousness and the fairness and legitimacy of the decisions made (Selman, 2001; Horelli, 2003; Fung & Fischer, 2017). It can support the development of social capital, potentially making the public more knowledgeable and competent (Laurian & Shaw, 2009). Also, the reputation of planning overall might increase (Laurian, 2004).

However, problems can arise when participation is managed poorly. Importantly, distrust can arise when participation is perceived as a ritual designed only to meet legal requirements and in the presence of inequalities in representation (Sibale and Fischer, 2023; Innes & Booher, 1999). Another problem is a perceived waste of time and cost. The long duration of participatory processes can lead to perceptions that time is wasted. If participation processes are perceived to be lengthy, the enthusiasm of participants may be reduced. In addition, participation processes may occasionally become processes that serve more individual interests rather than the public (Newig & Oliver, 2009). Moreover, it can lead to the accusations that the interests of those who cannot participate are being ignored (NRC, 2008). Finally, even in the presence of public participation, decisions may still be considered questionable (Irvin & Stansbury, 2004).

While participation is part of the decision-making processes in democratic societies, different countries assign different roles to the public. In representative democracies, citizens are said to authorise representatives to decide on their behalf, giving them the authority to make and implement policies. Thus, administrators make decisions on behalf of the public (Healey, 1997; Ehn, 2008; Michels & De Graaf, 2010; Ataöv, 2013).

The setup of participation processes varies, not just from country to country but potentially also between different places in the same country. Also, participation differs in terms of level of influence (Arnstein, 1969; Bruns, 2003; NRC, 2008; IAP, 2014; Horelli, 2003 ;Archon, 2006; Blondet et al., 2017; Mueller, Lu, Chirkin, Klein, & Schmitt, 2018; Ananda, 2007). In this context, the International Association for Public Participation suggests that all participation levels are legitimate and that they can all be applied depending on the objectives of a particular decision-making process (NRC, 2008).

3. Methodological Approach

Decision-making is about identifying and evaluating alternatives to solve problems or achieve a goal by selecting the best alternative (Bhushan & Rai, 2007). Therefore, there is a need for analytical methods and tools that support learning and enable negotiation for a more democratic participatory process in urban planning (Diez-Rodriguez et al, 2019). An integrated approach is introduced within this context combining 2D mapping/analysing and 3D visualisation capabilities of computer-aided design software such as ArcGIS and SketchUp and the AHP's decision support methodology.

3.1. 2D and 3D Visualization in the Decision-making Process

In decision-making processes, the main benefit of using computer technologies is increasing the quality of the interaction between experts and the public and contributing to determining the best decision alternatives (Wu, He, & Gong, 2010). To support participants in understanding an existing baseline, and to help derive an understanding of the positives and negatives of different alternatives, 2D mapping/analysing and 3D visualisation computer-aided software such as ArcGIS and SketchUp can be used.

GIS-based software is widely used in public policy production as a computer program for mapping, analysing and visualising spatial data using geographic information (Dunn, 2007; Kahila-Tani et al., 2016; González and Geneletti, 2021). In this context, GIS and AHP can be integrated for weighting and prioritising options in land-use decision-making processes. In selecting the most suitable area for a land-use decision, in AHP decision-makers determine priority weights of criteria and alternatives. Then they produce maps that show the appropriate site selection decision by using GIS techniques and procedures (Estoque, 2012; Malczewski, 2006; Malczewski & Rinner, 2015; Brown & Kytta, 2014).

2D/3D visualisation can be integrated into the AHP process with maps and animations generated by computer-aided software to increase participants' interaction and communication capacity. For example, GIS can map and analyse location-specific data in 2D or 3D. In addition, alternatives related to the project area can be visualised in a three-dimensional (3D) format using design software in the decision-making process (Oswald, 2004; Salter, Campbell, Journeay, & Sheppard, 2009; Boroushaki & Malczewski, 2010; Zhang & Fung, 2013; Okumuş & Türkoğlu, 2017).

These capabilities of computer-aided software can lead to a simplification of planning issues and increase the ability of participants to understand and interpret spatial data. In the subsequently proposed framework, 2D and 3D visualisations are integrated with the AHP process according to a decision's nature.

3.2. Analytic Hierarchy Process (AHP)

The AHP method, developed by Thomas Saaty in the late 1970s, is a multi-criteria decision support model based on mathematical principles, enabling complex decision problems to be dealt with in a hierarchical structure. **It makes paired comparisons between criteria using the eigenvalue approach, which determines the numerical priorities of the criteria affecting a decision.** The AHP, which aims at providing a transparent way of transferring stakeholder preferences into the decision-making process, enables the creation of a systematic decision-support model in complex situations, involving multiple factors. It handles a decision case in a hierarchical system, considering the primary target, factors, sub-factors and alternatives. This hierarchical structure formed by the AHP reveals the general appearance of complex relations during the decision-making process. Thus, the AHP makes it possible to rank decision options and suggest an optimised solution after associating them with multiple criteria (Saaty T. , 1988; 1989; 1990; 2008 Filipović, 2007; Saaty & Sodenkamp, 2010; de Luca, 2014; Mu & Pereyra-Rojas, 2017; Gürsakal, 2015; Önder & Önder, 2015; Saaty R., 1987).

AHP consists of various steps, including defining the problem or the purpose, the structure of a decision hierarchy, formation of pairwise comparison matrices, calculation of relative weights of factors, checking the consistency of a decision, sensitivity analysis and a final decision (Saaty R., 1987; Saaty T. 1990; 2000; 2003; 2008; Modarres & Zarei, 2002; Bhushan & Rai, 2007; Filipović, 2007; Bunruamkaew & Murayama, 2011; de FSM Russo & Camanho, 2015). **This allows participants to make pairwise comparisons between criteria and select the most appropriate alternative based on their priorities.**

The most important advantage of the AHP method is its ability to integrate qualitative and quantitative information and evaluate criteria and alternatives according to priorities. The method enables the translation of participants' subjective opinions to convert into numerical values. **In this context, the AHP considers participants' objectives and subjective judgments.**

This enables participants to reflect on their understanding of a particular case. An essential advantage of the AHP is that it is easy to understand and implement. **Decision problems are evaluated within hierarchical structure, consisting of criteria and alternatives that help to understand the current situation and support quick problem-solving. Also, the AHP technique makes decision processes transparent. Scrutiny of the judgements made by stakeholders increases transparency and provides a platform for negotiation** (Ananda, 2007; Bhushan & Rai, 2007; de FSM Russo & Camanho, 2015).

Since public decisions can affect many people, developing collective group opinions is a way to support participatory democracy. The AHP is a useful tool in obtaining a single verdict by discussing the opinions of individuals from different sections of society on a subject. It allows participants to express their preferences and objectives and reconcile them with those of others. Making a group decision means bringing individual judgments into a single judiciary representing the whole group and implementing a group preference (Saaty T., 2000; 2008). In AHP, a negotiation environment is established through brainstorming, leading to a better understanding of the subject. Every judgment is discussed until a consensus is reached. The aim is to bring stakeholders together for an exchange of ideas and to reach a collective judgment.

If there is no compromise between values, a group preference can be created from individual preferences. In the analytic hierarchy method, a survey can be conducted to combine different people's judgments (Filipović, 2007). Those involved in decision-making can use the 1-9 scale of Saaty to express their priorities for each criterion and its sub-criteria. Through a pairwise AHP comparison matrix, Saaty suggests that survey results should be combined with the geometric mean method and entered into the model as a single judiciary (Saaty & Vargas, 2012; Önder & Önder, 2015; Wanga, Hub, Li, & Liub, 2016). In this context, a single judgment is obtained by surveying all levels in the hierarchy and prioritising the decision alternatives by evaluating all criteria. This increases consistency of resulting matrices. Furthermore, all stakeholders have a say in the decision. Thus, there may be less conflict in the discussion of possible outcomes.

Another beneficial feature of the AHP technique is that it can be combined with different decision-support methods and techniques. For example, the AHP can be used with multi-criteria decision

methods such as TOPSIS, VIKOR and ELECTRE (Uludağ & Doğan, 2016). In such cases, the weights usually obtained with AHS are used as input in different methods. Also, the AHP can be integrated with a SWOT analysis, which provides a systematic analysis of the opportunities and threats that are inherent to e.g. a residential area and the strengths and weaknesses of this area (Kajanus, Kangas, & Kurttila, 2004). Whilst computer programs such as Expert Choice, Super Decision and MakeItRational have been developed to implement the AHP, Microsoft Excel can also be used (Ishizaka & Nemery, 2013).

Limitations of AHP include that decision-makers may find it challenging to interpret the comparison values between 1 and 9. Also, AHP ignores the interaction between decision-makers. To overcome this issue, it is useful to organise meetings where opinions are exchanged between individuals, especially in the process in which group decisions are made (Ananda, 2007; de FSM Russo & Camanho, 2015).

3.3. The Proposed Framework

The standard planning process consists of preparation, evaluation of the current situation, design of a plan, implementation and monitoring (Horelli, 2003; Ataöv, 2013; Brown & Kyttä, 2014). In our proposed decision support framework, 2D/3D visualisation and AHP methods are integrated while the stages of the standard planning process are preserved as the backbone. The aim is to judge the development and determination of alternatives. This means the role of the people in the process is the level of collaboration which is the fourth level of the spectrum defined by the International Association for Public Participation (NRC, 2008; IAP, 2014). In this context, the literature on the participatory decision-making process was examined, and the fundamental principles for the proposed decision support model were defined (Tablo 1). In line with these principles, the proposed decision support process stages are determined below (Figure 1).

Agenda-setting

To determine issues to be considered in the planning process, problems and aims related to a particular planning area need to be determined at the agenda-setting stage (NRC, 2008). Therefore, the agenda text should provide information on the following issues related to the decision-making process (Horelli, 2003; Gregory et al., 2012; Ataöv, 2013; Lienert et al., 2015):

- Scope and limits of the decision,

- Need for public participation,
- Experts that manage the process and their roles,
- Stakeholders and their roles,
- Negotiation methods, aims, dates and places,
- Decision-support methods,
- Expected outcomes and success criteria,
- Observation and evaluation system.

The agenda text should be shared with the public. Also, it should be clearly indicated what kind of contributions are expected from participants. In this context, the first contact should be made personally (usually by mail). Also, the agenda text can be announced by e.g. local radio and television stations, places of worship, schools and others (Laurian, 2004).

Data Collection and Analysis

The success of the decision support function depends on an adequate analysis of the current situation. In this context, the experts who manage the process need to collect data, process them and produce a visual representation (such as a chart, graph, or map). Visual materials and analyses should be created, using GIS' spatial analysis capabilities. Also, a SWOT analysis can be performed in which internal and external conditions are evaluated, depending on the scale of the decision problem (Ataöv, 2013).

Determination of Criteria and Alternative Scenarios

It is necessary to identify criteria affecting the purpose defined during the agenda-setting stage and the alternative scenarios of decisions. Two methods are used to determine them. Firstly, experts identify possible criteria. Secondly, criteria are picked that reflect the wishes of those citizens who will be affected by the decision. Since the aim is to ensure negotiation-based and open participation, the participatory appraisal¹ workshop method should be used as the consultation method (Laurian & Shaw, 2009). This is a participation method that allows participants to express their opinions and encourage negotiation.

¹ Participatory Appraisal defines a set of approaches that enable people to make decisions about the future through self-expression and learning of new information. In order for people with different needs and thoughts to explore issues, the method aims to encourage people who are reluctant to participate in meetings by using visual tools in the production process (Involve, 2005).

Table 1. The fundamental principles of the proposed decision support framework

Principle	Definition of the principle
Determination of scope	<p>To clarify the limits of the model, the scope of the decision-making process needs to be determined.</p> <ul style="list-style-type: none"> The purpose: Participants should know the aim (Atlee et al., 2009; Mu & Pereyra-Rojas, 2017). The public participation level: As the participation level in the selection of the tools and methods to be used in the accession process will play an important role, it should be determined which participation level to adopt from the public participation spectrum on the decision-making process (Horelli, 2003; Laurian & Shaw, 2009; IAP, 2014). The representation level: In accordance with the principle that those affected by the decision have the right to be involved in the participation process (Laurian, 2004; Brown & Chin, 2013; IAP, 2014), participants must include a representative sample of the population affected by the decision and the community from each part of the community (Rowe & Frewer, 2000; Irvin & Stansbury, 2004; Atlee et al., 2009; Kahila-Tani et al., 2016). Public authorities should use effective communication methods to increase people's awareness about the decision-making process within this scope. If necessary, an appropriate representation sample can be determined by methods such as mapping techniques or stakeholder analysis (Horelli, 2003). However, it is wrong to assume that more people are better, and the number of participants may vary depending on the qualification of the decision to be made (Involve U. , 2005; National Research Council, 2008). Duration: In today's society, time is a precious issue for people. Therefore, time should be well planned and realistic until the final decision is announced (OECD, 2001; Involve U. , 2005). Process managers should determine how much time each stage of the decision-making process will be completed and allocate sufficient time. A timeline should be created for participants to allocate time and organise themselves.
Clarity	<p>The administrator must clearly identify and publicise the roles and responsibilities of citizens and government (at what stages, how they will contribute) in the public participation process. The administrator must commit to sharing information in a complete, objective, reliable and comprehensible manner (OECD, 2001; Brown & Chin, 2013).</p>
Early participation	<p>The principle of participation is that people potentially affected by a decision should be involved in the primary decision-making stage at the beginning of the process (Involve U. , 2005). This is necessary for understanding the expectations of the people and for the emergence of more solutions (Rowe & Frewer, 2000; Ridder & Pahl-Wostl, 2005; Ataöv, 2007b; Hassan, El Hefnawi, & El Refaie, 2011; Brown & Chin, 2013; Kahila-Tani et al., 2016) In addition, early involvement of people in the participatory process not only ensures the effective use of information but also increases the confidence of the participants in the process and strengthens their commitment to the decisions made (Innes & Booher, 2004).</p>
Transparency and reliability	<p>For a successful decision-making process, mutual trust must be built between participants. Designing a transparent and reliable decision-making process is essential to ensure that participants trust the decision-making process and establish lasting relationships (Irvin & Stansbury, 2004; Laurian, 2004; Ridder & Pahl-Wostl, 2005; Laurian & Shaw, 2009; Fung A. , 2015). Blondet et al. claim that creating mutual trust in the participatory process is of crucial importance (Blondet et al., 2017). In this framework, at each stage of the participation process, the administrator should share the summary report or final report with the public, explaining how decisions are made, how the roles are distributed, and how the opinions and suggestions of citizens affect the decisions (Rowe & Frewer, 2000; Brown & Chin, 2013; de Luca, 2014). In addition, it is explained how participants use the right of objection and appeal. If necessary, independent counsellors should manage the process.</p>
Educational	<p>Participation should provide people and professionals with meaning and increase public awareness (Laurian & Shaw, 2009). Participation in the decision-making process enables the public to learn about the purpose of the decisions made about the city and the professionals to learn about the problems and priorities of the people (Ridder & Pahl-Wostl, 2005; Wanga, Hub, Li, & Liub, 2016). Furthermore, listening to participants allows them to emerge new ideas and create new alternatives. This increases the learning capacity and participation motivation of the participants (National Research Council, 2008).</p>
Fair and impartial	<p>Participation should give equal opportunities to stakeholders to access information, consult and participate (Brown & Chin, 2013). The participatory process should be designed in such a way as to prevent influential groups (elites) from dominating the process, encouraging the participation of groups that are excluded from society or who have barriers to joining the process (Innes & Booher, 2000; Laurian, 2004; Bannon & Ehn, 2012). The participation process should be accessible to everyone with applications such as payment of transportation costs, provision of different participation options, and provision of nursery service. The information provided by the government in the participatory process should be objective, complete and accessible to stakeholders. Attitudes and behaviours that may cause polarisation should be avoided. If deemed necessary, an independent auditor should supervise the process.</p>
Resources	<p>In the decision-making process, sufficient human, time, financial and technical resources should be allocated to enable the information, consultation and policy-making process to succeed. At the start of the process, it is necessary to organise the places where the participants feel comfortable and provide adequate information materials (OECD, 2001; Irvin & Stansbury, 2004; Brown & Chin, 2013).</p>
Human resources	<p>The administrative and public officials should be aware of their responsibilities in planning and managing participation. Professionals should have the tools and skills to encourage participation alongside their technical expertise (Fainstein, 2000; Laurian, 2004; Ataöv, 2007b). To prevent the negotiation from becoming a waste of time in the decision-making process, professionals are responsible for determining which issues should be negotiated and communicating the information produced to society so that people understand.</p>
Influence	<p>Influence is a reflection of the information agreed by the participants to the final decision in the decision-making process (Rowe & Frewer, 2000). Therefore, implementing a participatory process is to promise people that their ideas will be taken into account (IAP, 2014; Fung A. , 2015). For this reason, participants' contributions to the process should not be limited to official documents (Ehn, 2008), but it should be ensured that the will of the people influences the decision made.</p>
Result-orientation	<p>If the participants see that their ideas affect the decisions made, they tend to trust the decision-making process more (Ridder & Pahl-Wostl, 2005). Participants are motivated to participate in a similar participation process. Hence, the participation model should be result-oriented (Ataöv, 2007a)</p>
Determination of methods and tools	<p>Various methods and tools enable participants to negotiate and make collective decisions. However, since no single correct method applies to each participatory process, appropriate methods and tools should be determined to meet the stakeholder group's needs according to purpose and context (Creighton, 2005).</p> <ul style="list-style-type: none"> Determination of consultation methods: A negotiation method allowing an appropriate number of participants to express their opinions should be determined in the direction of the purpose (Brown & Chin, 2013). These techniques include participatory appraisal, focus group meetings, and community consultation meetings (Involve U. , 2005). Determination of decision-making methods: In the decision-making process, an objective and analytical decision-making method in which the public can express their preferences and objectives to achieve the determined goal must be determined (Zhang & Fung, 2013). Determination of communication methods: The appropriate communication techniques established with the participants increase the participants' confidence in the process and facilitate the construction of consensus (Wanga, Hub, Li, & Liub, 2016). It is usually the best communication way that people are invited as individuals into the participation process. However, according to the number of participants, methods such as mass mailing, brochure distribution, advertising to the press, informing various institutions and communities can be used to communicate with the participants (Involve U. , 2005). The important thing is to use a clear and comprehensible language when informing the participants.
Continuity	<p>In order to spread the participation culture in society, information tools should be applied continuously, and the experiences obtained from each participation practices should be conveyed in a way specific to the following practical application (Creighton, 2005; Atlee et al., 2009).</p>

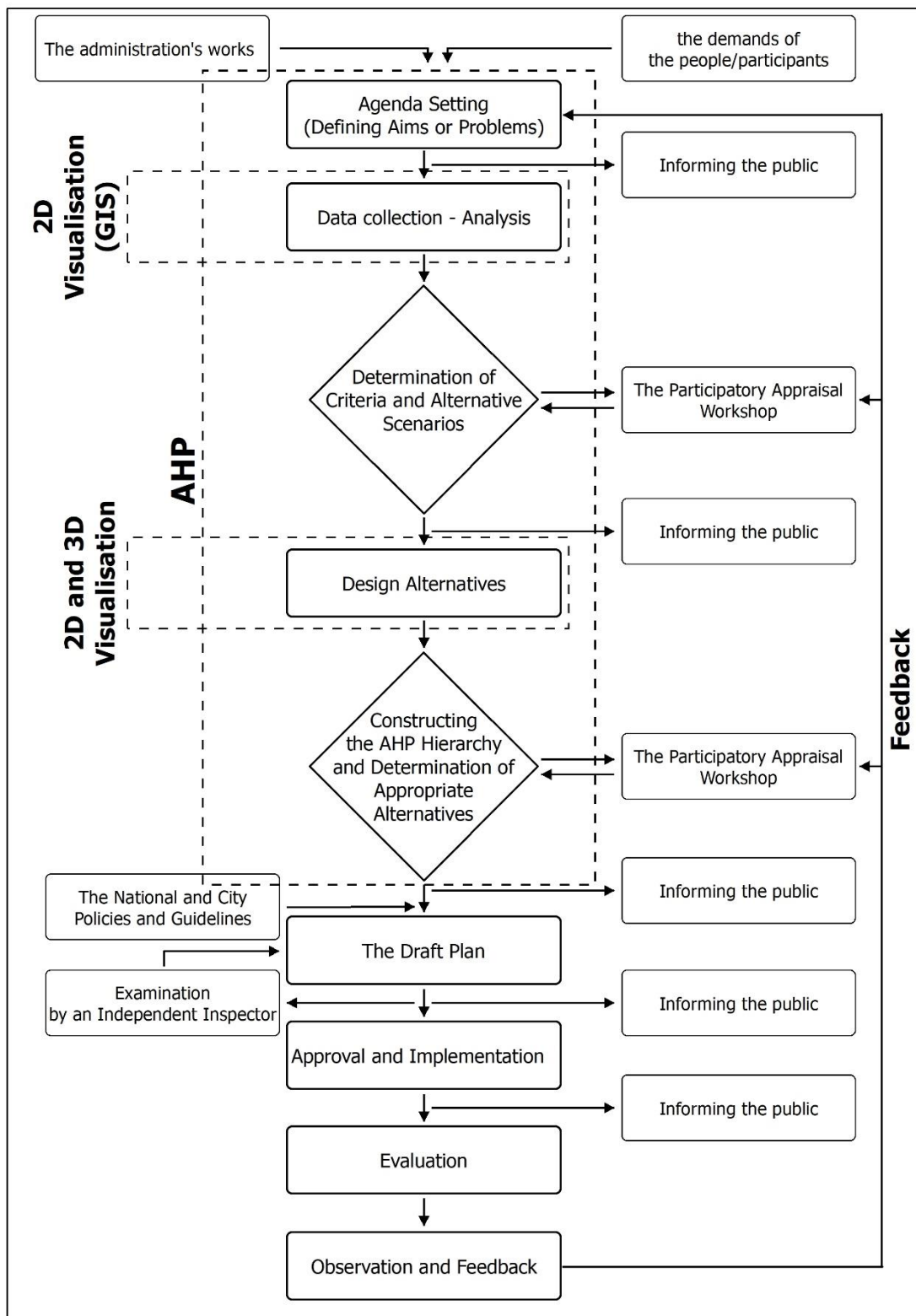


Figure 1. The Proposed Participatory Decision-Making Process (adapted from the decision-making process for a proposed plan in the UK)

The workshop, led by a facilitator, should begin with informing people about the evaluations and analyses prepared by experts for a project. Next, participants should express their opinions on the factors that should be considered. Each participant should be allowed to express themselves

(Horelli, 2003; Mu & Pereyra-Rojas, 2017). At these meetings, participants should be able to freely express their concerns and make recommendations on the issues to be considered in the planning process. By assessing the opinions of the participants and the factors initially identified by experts, criteria to be used in the AHP method are determined (Zhang & Fung, 2013).

Moreover, possible alternative scenarios should be identified to solve identified problems or activate present potentials at this stage. It is essential to produce alternatives to make the best possible decision and to assess different perspectives. In the participatory appraisal workshop, participants should have time to state their opinions about possible alternative scenarios that help meet their needs (NRC, 2008; Lienert et al., 2015). For the decision hierarchy of the AHP to be established at a later stage, data obtained in the workshop need to be evaluated and criteria relevant to the purpose be determined (including possible sub-criteria) and possible alternatives. Factors that are similar to each other should be combined and unrealistic alternatives be eliminated to ensure that the decision hierarchy in the AHP is not too large. The opinions stated during the workshop, the experts' evaluations, and the outputs should be reported to the public.

Design Alternatives

To increase participants' interaction and communication capacity, solution-oriented alternatives should be created that participants can comment on. They should be compared by modelling them in a virtual environment by three-dimensional (3D) visualisation techniques of computer-aided design software, such as ArcGIS, Autocad and Sketchup (Koramaz & Gulersoy, 2011). Thus, participants can easily compare possible alternatives, using their priorities thanks to three-dimensional (3D) virtual urban models (Wu, He, & Gong, 2010).

Constructing the AHP Hierarchy and Determining Appropriate Alternatives

At this stage of the decision process, the most appropriate alternative should be determined by making pairwise comparisons of criteria and alternatives. In this sense, experts should establish a hierarchical structure composed of criteria, sub-criteria and alternatives to handle the decision-making process systematically. Also, experts should create pairwise comparison matrices for the participants to objectively evaluate criteria and alternatives (Gregory et al., 2012).

Since the aim is to determine the participants' priorities, an appraisal workshop for the participants to express their opinions should be organised. This should begin with introducing criteria and

possible design alternatives and by explaining the workshop's objective. Then participants should determine the importance of criteria and alternatives for the pairwise comparison matrices formed by the experts. Finally, a group decision will be made to determine the mutual ranking of factors and alternatives at the meeting. Two methods can be used at this stage:

- (1) A collective group decision, based on a discussion by participants. During each pairwise comparison, all participants are expected to agree on a collective value between 1 and 9. It may not be easy to achieve a collective value because of participants' different priorities and opinions. However, not every participant needs to agree on each problem component (Filipović, 2007).
- (2) A survey for ranking the factors and alternatives from 1 to 9 (Mu & Pereyra-Rojas, 2017). A collective value for mutual comparisons can be obtained based on the participants' answers by applying the geometric mean. Subsequently, data lead to the calculation of the AHP, and the most suitable alternatives are determined. Furthermore, when people cannot come together physically, the process can be exercised by sending a questionnaire to the participants.

Experts determine the most appropriate alternative based on the results of the AHP. In the AHP process, administrators should share reports, including the decision hierarchy, the pairwise comparison matrices, the priority and consistency calculations and the outcome as soon as possible in the interest of a transparent decision support process.

The Draft Plan

At this stage, a draft plan should be prepared to integrate the most appropriate alternative design identified by the AHP method. An independent auditor should examine whether the draft plan conforms with the decisions taken in the accession process and with legal requirements.

Approval and Implementation

After evaluations of the draft plan and corrections are made, if necessary, the plan is approved and implemented.

Evaluation

At the evaluation stage, whether the decision made has reached its stated objectives is established. At this stage, the opinions of participants should be taken into account. Participants are asked

questions such as whether the process meets goals and objectives, whether the process meets the demands of the participants, whether the methods and techniques used and the level of participation are sufficient. Thus, some final thoughts on the success of the accession process are obtained. Also, stakeholder feedback should be collected and analysed at every stage of the participation process. Findings should be used to produce a decision and plan subsequent participatory activities.

Observation and Feedback

Whether the decision made leads to solving a problem and is suitable for the purpose determined at the beginning of the process is checked. If the problem is not solved or if the decision does not meet the aim, there is a need to investigate the reasons.

4. Case Study

The proposed framework was tested in a decision-making process of a regeneration project; 'Plot 10' in Liverpool. Plot 10 is located on the eastern edge of Liverpool City Centre, between the University of Liverpool and Edge Hill and Kensington neighbourhoods (Figure 2). Here, Liverpool City Council is developing a project called Paddington Village (Liverpool City Council, 2023a) which includes Plot 10. Whilst the project will affect the entire city, the main impact will be on surrounding residential areas. Plot 10 was chosen as the case study due to Liverpool City Council currently discussing changes to an existing plan decision.



Figure 2. Location of Plot 10

According to Liverpool Local [Land use] Plan's policies, the site covering Plot 10 is a "Mixed Use Area". (Figure 3). *"The designation of Mixed-Use areas and Sites for Various Types of Development is intended to promote development which can make a significant contribution to the regeneration of the local economy, providing enhanced employment prospects and opportunities for environmental improvement."* (Liverpool City Council, 2023b). In line with this policy, Liverpool City Council aims to create an international development zone in the Paddington area to attract investment and increase employment opportunities. The plan is to create a place for trade, housing, technology, education, health facilities and events. A standard participation procedure was applied in the decision-making process for Plot 10. The proposal plan decision was announced to the public via the internet and mail. However, as the owner of the Paddington site, Liverpool City Council cooperated closely with existing and potential investors (Liverpool City Council, 2023a). In this participation process, decision-makers and investors were the main actors, rather than the local people.

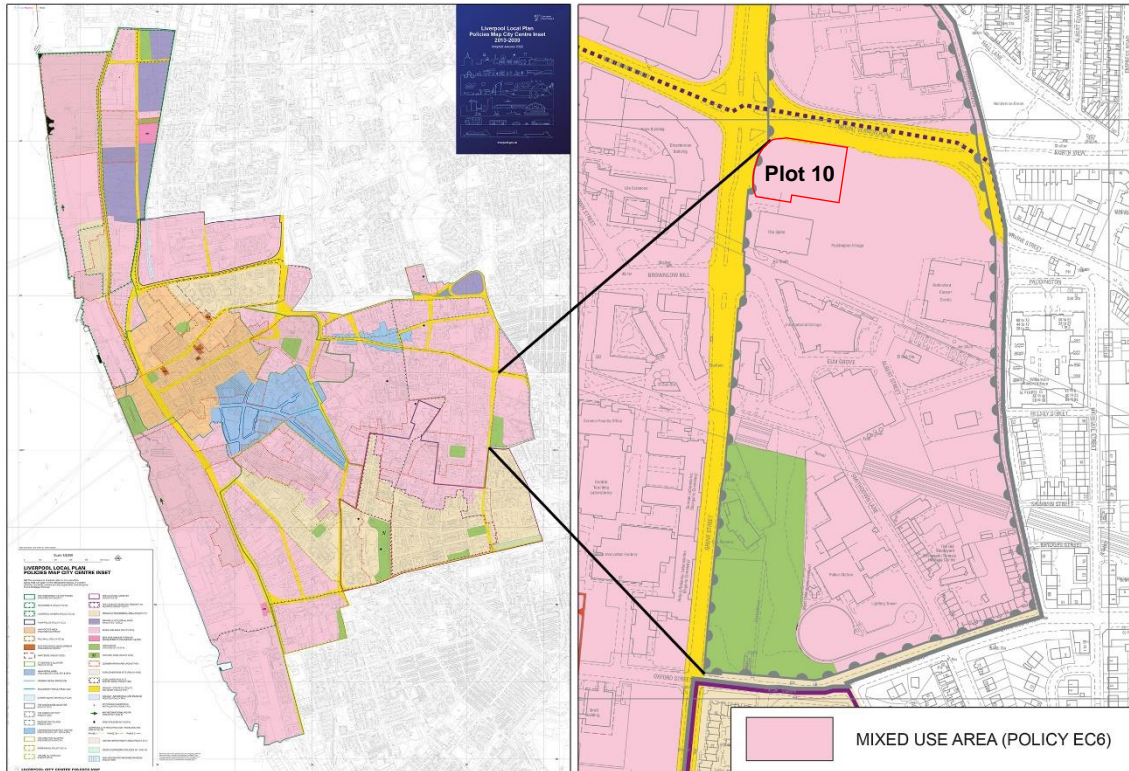


Figure 3. Liverpool Local Plan - City Centre area (Liverpool City Council, 2023c)

For the purpose of testing the framework, focus group members were to be chosen that had a good understanding of the site. Due to its location next to the university campus 12 doctoral students were appointed. Focus group members participated in the proposed model simulation. They provided feedback on whether they thought the approach would lead to the general public effectively participating in the decision-making process. Ten focus group members participated in all phases of the process. First, an appraisal workshop (approximately 1 hour) was held during the pilot participation process. At the beginning of the workshop, the case study area was introduced, using analysis maps prepared with GIS. After that, participants discussed what the plan decision of Plot 10 should be. The analytical infrastructure of the AHP is used in the proposed decision support process. In the appraisal workshop which was led by a focus group member who was a PhD student in architecture and working in an architectural company, focus group members addressed two critical issues:

- their opinions on the design criteria that should be considered in the case study,
- their opinions about possible alternative scenarios helping make plan decisions.

In the workshop, the participants listed the design criteria that should be evaluated. These include; green space, accessibility, human scale, sustainability, identity (place-making), harmony (with

surrounding buildings), transportation (such as junctions, cars, and parks), and income (from the sale of land by the council). The participants also listed the possible plan/design alternatives that should be considered, as follows; low-cost housing, sports centre (activities), youth centre, cancer care centre, car park and top a green space, bicycle centre, and multi-function space (such as public space / outdoor play area, market).

Next, in order to evaluate the design criteria and possible alternatives (determined by the focus group in the workshop), focus group members filled out a questionnaire based on the AHP. The questionnaire aimed to determine participants' priorities regarding the plan decision for Plot 10 by comparing each criterion and decision alternatives with each other. The survey consisted of two parts (see the appendix). In the first part, the focus group members compared their priorities regarding the design criteria determined during the workshop. Then members compared their priorities for three-dimensional plan/design alternatives regarding each criterion (Figure 4).

B. The Pairwise Comparison of 3D Models (you can see models at appendix) for each Factor.

1. The Pairwise Comparison of 3D Models according to GREEN SPACE

Select the option that has priority for you in the pairwise comparison, using the scale from 1 to 9 (where 9 is extremely and 1 is equally important), Please indicate (X) the relative importance of options A (left column) to options B (right column).

3D Models A Options	Extremely	Very Strongly	Strongly	Moderately	Equally	Moderately	Strongly	Very Strongly	Extremely	3D Models B Options
	9	8	7	6	5	4	3	2	1	
Affordable Housing										Sport Centre (activities)
Affordable Housing										Youth Centre
Affordable Housing										Maggies Centre
Affordable Housing										Carpark and Top A Green Space
Affordable Housing										Bicycle Centre
Affordable Housing										Multi-function Space (public space, play area, market etc.)
Sport Centre (activities)										Youth Centre
Sport Centre (activities)										Maggies Centre
Sport Centre (activities)										Carpark and Top A Green Space
Sport Centre (activities)										Bicycle Centre
Sport Centre (activities)										Multi-function Space (public space, play area, market etc.)
Youth Centre										Maggies Centre
Youth Centre										Carpark and Top A Green Space
Youth Centre										Bicycle Centre
Youth Centre										Multi-function Space (public space, play area, market etc.)
Maggies Centre										Carpark and Top A Green Space
Maggies Centre										Bicycle Centre
Maggies Centre										Multi-function Space (public space, play area, market etc.)
Carpark and Top A Green Space										Bicycle Centre
Carpark and Top A Green Space										Multi-function Space (public space, play area, market etc.)
Bicycle Centre										Multi-function Space (public space, play area, market etc.)





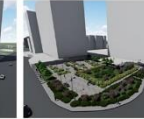










Figure 4. A Sample of AHP questionnaire

Focus group members expressed their priorities regarding factors and alternatives for Plot 10. The different judgments of each member in the paired comparison process were combined with the geometric mean. Thus, consolidated priorities were obtained for each comparison. The

questionnaire data were analysed with the Super Decision program. Analysis results regarding the design criteria showed that the first priority of focus group members was transportation (such as the road junction nearby, cars and parking) with a value of 26.30%. Their second priority was green space, with a value of 18.50% (Table 2).

Table 2. A Hierarchy with Consolidated Priorities

DECISION HIERARCHY									
GOAL (The Best Decision for Plot 10)	FACTORS (determined at the workshop)		POSSIBLE PLAN/DESIGN ALTERNATIVES (Alternatives determined at the workshop and alternatives' priorities calculated according to focus group surveys in terms of factors)						
	Factor	Factor Priority	Affordable Housing	Sport Centre (activities)	Youth Centre	Maggies Centre	Carpark and Top A Green Space	Bicycle Centre	Multi-function Space (public space, play area, market etc.)
	Green Space	18.50%	0.189	0.101	0.132	0.101	0.175	0.067	0.235
	Accessibility	14.20%	0.133	0.124	0.137	0.092	0.167	0.107	0.24
	Human Scale	7.80%	0.255	0.126	0.108	0.091	0.144	0.07	0.204
	Sustainability	15.30%	0.129	0.112	0.123	0.123	0.13	0.156	0.227
	Identity (place-making)	6.70%	0.173	0.15	0.134	0.123	0.111	0.085	0.224
	Harmony	11.20%	0.273	0.099	0.096	0.09	0.137	0.101	0.206
	Transportation	26.30%	0.22	0.154	0.11	0.101	0.127	0.095	0.194
	PRIORITIES of ALTERNATIVES			19.40%	12.50%	12.00%	10.20%	14.30%	9.90%

When all the paired comparison data were evaluated, participants preference was for Plot 10 to be planned as a multi-functional space with a value of 21.7%. The second preference was for Plot 10 to be planned as affordable housing with a value of 19.4% (Figure 5 and 6).

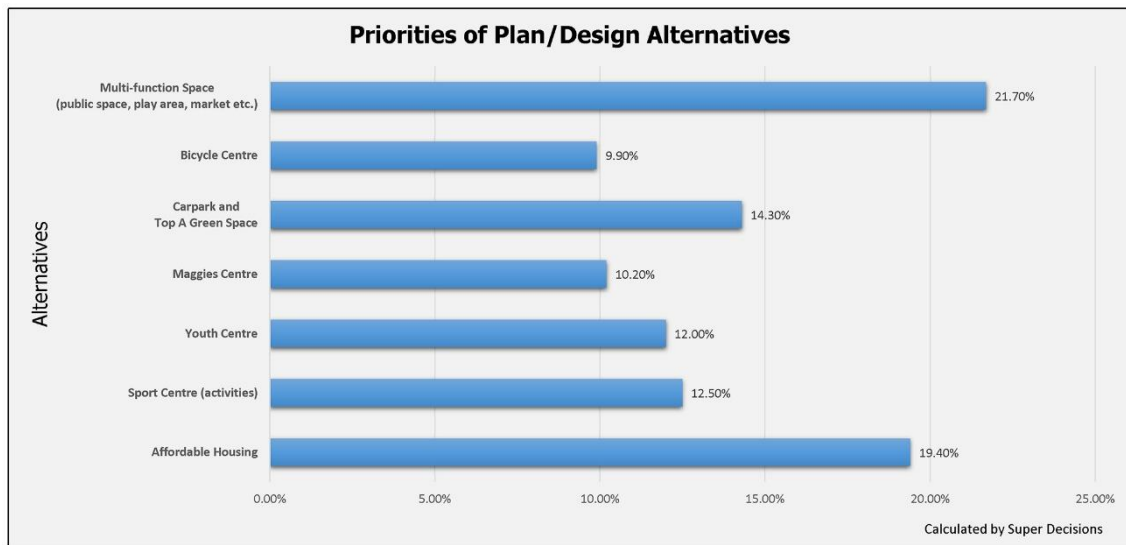


Figure 5. Consolidated Weights of Design Alternatives' Priorities



Figure 6. Participants' first priority alternative is a multi-functional space (21.7%) for Plot 10

5. Results and Discussion

Following completion, focus group participants evaluated the whole process through a questionnaire. The purpose was to learn about focus group members' opinions on the proposed framework. Ten focus group members participated and the results are as follows:

1. Do you believe your ideas are being included in the decision-making process? Do you feel your experiences and expectations have been considered in the decision-making process?

All focus group members in the survey answered “Yes” to this question. Explanations given were broadly in line with the comment made by one of the members:

I believe my ideas are being included in the decision-making process as a scientific analysis with professional software was used to see the results. I feel my experiences and expectations have been considered in the decision-making process because I can see from the results that some of the chosen design alternatives are the ones I chose.

2. Would you participate in the decision-making process if a council uses the proposed method?

The rate of those who said "I would participate" to this question is 60%. The focus group members who said "I would not participate" stated that they could not attend because they were busy or did not have enough time. However, the most significant criticism regarding the proposed method among the members who said "I would not participate" was as follows;

Unlikely, because it was a very long and repetitive process ranking every characteristic of the site, I think that giving qualitative opinions is a better option.

3. *Can participants learn something during through the proposed process?*

All participants stated that they gained a new perspective from the decision process in general. They thought that the proposed participation method could bring a new perspective to the participants. One of the members expressed this situation as follows;

Yes, I do think there are things I could learn from this activity. Basically participants are architecture-related students but studying in different areas like in sustainability, design, culture and social aspects, [so] it is interesting to learn to thinking from different points of view for the same project.

4. *Do you think the proposed participation process is usable in the current decision-making process?*

The focus group members generally stated that the method could be used in current decision-making. However, some members emphasised that the pairwise comparisons arising from the AHP method should be reduced.

5. *Did 3D models help you make your decision?*

Participants stated that the 3D models helped them better understand the space and the surroundings and to make decisions.

6. *Can a transparent and accountable decision-making process be achieved with the proposed decision-making model?*

Participants stated that the method could provide a more transparent and accountable decision-making process. However, the method and how the different votes are weighted needed to be explained more clearly to the people involved in the decision-making process;

7. *How does using the AHP method in the proposed model affected your choice?*

Most of the participants stated that using the AHP method within the scope of the proposed model was beneficial and efficient when comparing the criteria, as expressed by the following statements of three members:

I think the AHP method is very useful and efficient to make a decision when facing many different factors which affects the results.

AHP model make the process more understandable and easier for me.

Using the AHP method gives us the freedom of showing our feelings and thoughts in a detailed manner.

Some members also thought that it was slightly confusing to ,constantly compare the same criteria. One member expressed this as follows:

It was so confusing. If I was not a well-educated person, I would not complete it. I believe it can be more effective when it is designed simpler (Member 4).

8. *Do you think the proposed process is beneficial or a waste of time?*

90% of the focus group members who participated in the case study stated that the proposed participation process was beneficial. However, one member stated that the pairwise comparisons take too long, and the public will not want to spend time on it:

I can see the value of it, however, it took far too long to rank every option and I don't think members of the public would be happy to do this (Member 2).

9. *Did you have any difficulty in the participation process? If so, what did you find challenging?*

While the majority of the focus group members were satisfied with the proposed participation process, some members also determined difficulties, as follows;

The questionnaire was so detailed and hard to understand.

The discussion was quite fluent and in an easy mood, so everyone shared idea from their own research background. I guess more pictures and videos may help participant's thinking.

10. *Do you think the public would be able to understand the proposed participatory process?*

80% of the focus group members stated that the process is useful and easy to understand. This was expressed by one member as follows:

The proposed participatory decision-making process would be a beneficial system that UK planning councils could potentially utilise. Unfortunately, government cuts in funding at national level have led to short staff areas and further Covid effected months have exposed a short fall of workers. I would be happy to see this scheme used more.

However, some members stated that the public would have difficulty in understanding the process and that the process should be simplified:

I think members of the public would struggle to understand the maths behind the process but you could make it simpler (Member 2).

The results show that the proposed framework does allow participants to express themselves and that it can support decision-making. Furthermore, participants emphasised that it provided a transparent and accountable support process, in particular as participants had the right to speak at the workshop. Furthermore, their ideas were included through a questionnaire. Allowing people to express their opinions and influence the decision will increase their confidence in the participation process and ensure that they do not see it as a waste of time.

Findings indicate that participants gained new perspectives on different issues. The main reason is that focus group members with different expertise could negotiate and bounce ideas off each other during the meeting. It is an essential aspect of any participatory planning approach that technical issues need to be dealt with at a level which the public can understand. In addition, 3D visuals of alternative designs help those participating. In the case study, learning during the participation process positively affected participants' willingness to participate.

The main reasons for members favouring the AHP method are that it offers an objective methodology, transparently transfers stakeholder preferences to the decision-making process, makes a single judgment by comparing the criteria, and systematically evaluates participants' opinions. Therefore, using the AHP method in decision-making increases people's confidence in the process. Furthermore, using the AHP method in the proposed decision-making framework can accelerate the process and enable people's priorities to determine the final decision.

A limitation of the AHP method is that the priority order is determined by pairwise comparison of all criteria. The resulting increase in the number of criteria to be compared causes the process to become long and confusing. For example, members were asked to compare eight design criteria and seven design alternatives for each criterion in the case study. Some members described this process as too long, confusing and boring. **As a consequence, members of the public may not like it, and their willingness to participate may decrease. To eliminate this limitation, criteria and alternatives should be evaluated and reduced as much as possible at the first preparation stage or during the participatory appraisal workshop. Reducing the number of factors and alternatives in the decision-making process will reduce the number of pairwise comparisons, thus shortening the participation process.**

6. Conclusions

Participatory planning focuses on reaching stakeholders affected by plan decisions and understanding their needs and priorities. Participation can be carried out in the associated decision-making process at different **levels and methods**. **Using inappropriate methods in the participation process can undermine the public's trust and reduce the public's desire to participate.** **Meeting stakeholders' expectations are essential to increasing the decisions' legitimacy. It is in this context that in this paper a deliberative framework is introduced which aims at handling technical issues at a level that can be understood by the general public and where the participants' priorities are systematically evaluated.** The framework integrates visualisation and mapping/analysis capabilities of computer-aided design software with the decision support methodology of AHP. The proposed framework aims at informing stakeholders, allowing them to express their priorities, and to make judgments about developing and identifying alternatives. The framework was tested through a case study in Liverpool, UK. 12 PhD students from different professional areas formed the associated focus group, evaluating an inner city regeneration project. Members participated in the case study process phases and expressed their views on the proposed framework. Subsequently, advantages and shortcomings were revealed.

Tetsing suggests that the proposed model can be used in a participatory planning process if the number of criteria and alternatives is reasonable. Participants were able to express their priorities, and influence decisions. The framework can be applied through online meetings and surveys, if physical presence is not possible.

A potential limitation to the use of the framework is the number of factors to be compared. If this is too high, the process can become long and confusing. However, this can be addressed through thorough evaluation of factors and alternatives by the expert(s) managing the process, keeping their numbers **reasonable**. **In this context**, future studies should investigate how fewer factors can lead to a co-decision by discussing their priorities.

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References

- Aksakoğlu, E. (2007), *Yerel Kalkınmada Katılımcı Politikalar: Çanakkale Örnek Alan Değerlendirmesi* (unpublished PhD thesis), İstanbul, İTÜ Fen Bilimleri Enstitüsü.
- Allen, M., Regenbrecht, H., and Abbott, M. (2011), Smart-phone augmented reality for public participation in urban planning, *23rd Australian computer-human interaction conference*, 11-20.
- Ananda, J. (2007), 'Implementing participatory decision making in forest planning', *Environmental Management*, 534-544.
- Archon, F. (2006), 'Varieties of participation in complex governance', *Public administration review*, 66-75.
- Arnstein, S. (1969), 'A ladder of citizen participation', *Journal of the American Institute of planners*, 35, 216-224.
- Ataöv, A. (2007a), 'Planlamada sosyal bilimcinin değişen rolü: Toplumdan biri olmak', *METU JFA*, 24, 139-152.
- Ataöv, A. (2007b), 'Democracy to become reality: Participatory planning through action research', *Habitat international*, 31, 333-344.
- Ataöv, A. (2008), 'Constructing co-generative search processes: Re-thinking urban planning/making urban plans actionable', *European Planning Studies*, 16, 829-851.
- Ataöv, A. (2013), 'Karar verme süreçlerinin demokratikleşmesinde stratejik yaklaşımın rolü ve örnek uygulamalar Süreç Tasarımı, Katılım ve Eylem', *Planlama Dergisi*, 23, 125-133.
- Atlee, T., Buckley, S., Godec, J., Harris, R. A., Heierbacher, S., Nurse, L. and Mccallum, S. (2009), *The Core Principles for Public Engagement*, <http://ncdd.org/rc/wp-content/uploads/2010/08/PEPfinal-expanded.pdf> (accessed 03 January 2019).

- Bannon, L., and Ehn, P. (2012), Design Matters in Participatory Design, in J. Simonsen, & T. Robertson (eds), *Routledge International Handbook of Participatory Design*, London: Routledge, 37-63.
- Berntzen, L., and Johannessen, M. (2016), The role of citizen participation in municipal Smart City projects: Lessons learned from Norway, in J. Gil-Garcia, T. Pardo, & T. Nam (eds), *Smarter as the new urban agenda*, Texas: Springer, 299-314.
- Bhushan, N., and Rai, K. (2007), *Strategic decision making: applying the analytic hierarchy process*, London: Springer.
- Blondet, M., Koning, J., Borrass, L., Ferranti, F., and Geitzener, M. (2017), 'Participation in the implementation of Natura 2000: a comparative study of six EU member states', *Land Use Policy*, 66, 346-355.
- Borouhaki, S., and Malczewski, J. (2010), 'Measuring consensus for collaborative decision-making: A GIS-based approach', *Computers, environment and urban systems*, 322-332.
- Brown, G., and Chin, S. (2013), 'Assessing the effectiveness of public participation in neighbourhood planning', *Planning Practice and Research*, 28, 563-588.
- Brown, G., and Kyttä, M. (2014), 'Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research', *Applied geography*, 46, 122-136.
- Bruns, B. (2003), Water tenure reform: Developing an extended ladder of participation. *Politics of the commons: Articulating development and strengthening local practices*. Chiang Mai: RCSD Conference.
- Bryson, J., Quick, K., Slotterback, C., and Crosby, B. (2013), 'Designing Public Participation Processes', *Public administration review*, 23-34.
- Bunruamkaew, K., and Murayama, Y. (2011), 'Site Suitability Evaluation for Ecotourism Using GIS & AHP: A Case Study of Surat Thani Province, Thailand', *Procedia Social and Behavioral Sciences*, 21, 269-278.
- Creighton, J. (2005), *The public participation handbook: Making better decisions through citizen involvement*, San Francisco: John Wiley & Sons.
- De Fsm Russo, R., and Camanho, R. (2015), 'Criteria in AHP: a systematic review of literature', *Procedia Computer Science*, 1123-1132.

- De Luca, S. (2014), 'Public engagement in strategic transportation planning: An analytic hierarchy process based approach', *Transport Policy*, 33, 110-124.
- Dunn, C. (2007), 'Participatory GIS—a people's GIS?', *Progress in human geography*, 31, 616-637.
- Ehn, P. (2008), Participation in design things. *The tenth anniversary conference on participatory design*, Indiana: Indiana University, 92-101.
- Estoque, R. (2012), 'Analytic hierarchy process in geospatial analysis', in Y. Murayama, *Progress in geospatial analysis*, Springer: Springer, 157-181.
- Fainstein, S. (2000), 'New directions in planning theory', *Urban Affairs Review*, 35, 451-478.
- Filipović, M. (2007), The analytic hierarchy process as a support for decision making, *Spatium*, 44-59.
- Fischer, T. B. (2007), *The theory and practice of strategic environmental assessment: towards a more systematic approach*,. Routledge.
- Friedmann, J. (1998), 'The new political economy of planning: the rise of civil society', in M. Douglass, & J. Friedmann, *Cities for Citizens*, Chichester: Wiley, 19–38.
- Fung, A. (2015), 'Putting the public back into governance: The challenges of citizen participation and its future', *Public Administration Review*, 75, 513-522.
- Fung, H., and Fischer, T. (2017), 'Public Participation Window, Time and Outcome', *IAIA17 Conference Proceedings*, Montréal: The International Association for Impact Assessment. In <http://conferences.iaia.org/2017/final-papers.Php>, 1-6.
- Geray, C. (1998), Kentsel Yaşam Kalitesi ve Belediyeler', *Türk İdare Dergisi*, 70, 323-346.
- Gregory, R., Failing, L., Harstone, M., Long, G., Mcdaniels, T., and Ohlson, D. (2012), *Structured decision making: a practical guide to environmental management choices*, Oxford: John Wiley & Sons.
- Gürsakal, S. (2015), 'Çok Kriterli Karar Verme Yöntemleri', in M. Aytaç, & N. Gürsakal, *Karar Verme*, Bursa: Dora Basım-Yayımları, 243-274.
- Hassan, G., El Hefnawi, A., and El Refaie, M. (2011), 'Efficiency of participation in planning', *Alexandria Engineering Journal*, 50, 203-212.
- Healey, P. (1992), 'Planning through debate: the communicative turn in planning theory', *Town planning review*, 143-162.

- Healey, P. (1996), 'The communicative turn in planning theory and its implications for spatial strategy formation', *Environment and Planning B: Planning and design*, 217-234.
- Healey, P. (1997), *Collaborative planning: Shaping places in fragmented societies*. Vancouver: UBC Press.
- Healey, P. (1998a), 'Collaborative planning in a stakeholder society', *Town planning review*, 1-21.
- Healey, P. (1998b), 'Building institutional capacity through collaborative approaches to urban planning', *Environment and planning A*, 1531-1546.
- Horelli, L. (2003), 'A methodology of participatory planning', in R. Bechtel, & A. Churchman, *Handbook of environmental psychology*, New York: John Wiley & Sons, 607-628.
- IAP (International Association of Public Participation) (2014), *IAP2 Spectrum of Public Participation*, International Association of Public Participation. : https://cdn.ymaws.com/www.iap2.org/resource/resmgr/foundations_course/IAP2_P2_Spectrum_FINAL.pdf (accessed 10 October 2018).
- Innes, J., and Booher, D. (1999), 'Consensus building as role playing and bricolage: Toward a theory of collaborative planning', *Journal of the american planning association*, 9-26.
- Innes, J., and Booher, D. (2000), 'Public participation in planning: new strategies for the 21st century', The Association of Collegiate Schools of Planning, California: University of California, 1-39.
- Innes, J., and Booher, D. (2004), 'Reframing public participation: strategies for the 21st century', *Planning theory & practice*, 419-436.
- INVOLVE. (2005), *People and Participation: How to Put Citizens at the Heart of Decision Making*, London: Involve.
- Irvin, R., and Stansbury, J. (2004), 'Citizen participation in decision making: is it worth the effort?', *Public administration review*, 64, 55-65.
- Ishizaka, A., and Nemery, P. (2013), *Multi-criteria decision analysis: methods and software*, John Wiley & Sons.
- Kahila-Tani, M., Broberg, A., Kytä, M., and Tyger, T. (2016), 'Let the citizens map—public participation GIS as a planning support system in the Helsinki master plan process', *Planning Practice & Research*, 31, 195-214.

- Kajanus, M., Kangas, J., and Kurttila, M. (2004), 'The use of value focused thinking and the A'WOT hybrid method in tourism management', *Tourism management*, 25, 499-506.
- Koramaz, T., and Gülersoy, N. (2011), Users' Responses to 2D and 3D Visualization Techniques in Urban Conservation Process, *15th International Conference on Information Visualisation*, London: IEEE, 543-548.
- Kovács, E., Kelemen, E., Kiss, G., Kalóczkai, Á., Fabók, V., and Mihók, B. (2017), 'Evaluation of participatory planning: Lessons from Hungarian Natura 2000 management planning processes', *Journal of environmental management*, 540-550.
- Laurian, L. (2004), 'Public participation in environmental decision making: Findings from communities facing toxic waste cleanup', *Journal of the American Planning Association*, 70, 53-65.
- Laurian, L., and Shaw, M. (2009), 'Evaluation of public participation: the practices of certified planners', *Journal of Planning Education and Research*, 28, 293-309.
- Levend, S., and Erdem, R. (2017), 'Evaluation of Urban Decisions in the Context of Urban Regime Theory: The Case of Konya Courthouse Project', *International Journal of Engineering Inventions*, 6, 16-34.
- Lienert, J., Lisa, S., Egger, C., and Maurer, M. (2015), 'Structured decision-making for sustainable water infrastructure planning and four future scenarios', *EURO Journal on Decision Processes*, 3, 107-140
- Liverpool City Council. (2023a). *Paddington Village Spatial Regeneration Framework (SRF)*. Liverpool City Council: <https://liverpool.gov.uk/media/1359756/paddington-village-srf.pdf>, (accessed 14 March 2023).
- Liverpool City Council. (2023b). *The Liverpool Local Plan 2013–2033*. Liverpool City Council: <https://liverpool.gov.uk/media/1361302/01-liverpool-local-plan-main-document.pdf>, (accessed 14 March 2023).
- Liverpool City Council. (2023c). *Local Plan Inset Map (City Centre)*. Liverpool City Council: https://liverpool.gov.uk/media/1361296/liverpool-inset-map_lov3.pdf, (accessed 14 March 2023).
- Malczewski, J. (2006), 'GIS-based multi-criteria decision analysis: a survey of the literature', *International journal of geographical information science*, 20, 703-726.

- Malczewski, J., and Rinner, C. (2015), *Multi-criteria decision analysis in geographic information science*. New York: Springer.
- Michels, A., and De Graaf, L. (2010), 'Examining citizen participation: Local participatory policy making and democracy', *Local Government Studies*, 36, 477-491.
- Modarres, M., and Zarei, B. (2002), 'Application of network theory and AHP in urban transportation to minimize earthquake damages', *Journal of the Operational Research Society*, 1308-1316.
- Mu, E., and Pereyra-Rojas, M. (2017), *Practical Decision Making An Introduction to the Analytic Hierarchy Process (AHP) Using Super Decisions v2*. Pittsburgh: Springer.
- Mueller, J., Lu, H., Chirkin, A., Klein, B., and Schmitt, G. (2018), 'Citizen Design Science: A strategy for crowd-creative urban design', *Cities*, 72, 181-188.
- NRC (National Research Council) (2008), *Public participation in environmental assessment and decision making*, (T. Dietz, & P. Stern, Dü) Washington: National Academies Press.
- Newig, J., and Oliver, F. (2009), 'Environmental governance: participatory, multi-level—and effective?', *Environmental policy and governance*, 197-214.
- OECD. (2001), *Citizens as Partners. OECD Handbook on Information, Consultation and Public Participation in Policy-Making*. Paris: OECD Publications Service.
- Okumuş, G., and Türkoğlu, H. (2017), 'Komşuluk Birimi Ölçeğinde, Coğrafi Bilgi Sistemleri Tabanlı Bir Kentsel Sürdürülebilirlik Değerlendirme Modeli Önerisi', *Planlama Dergisi*, 27, 193-204.
- Oswald, M. (2004), 'Implementation of the analytical hierarchy process with VBA in ArcGIS', *Computers & Geosciences*, 30, 637–646.
- Önder, G., and Önder, E. (2015), Analitik Hiyerarşi Süreci, in B. F.Yıldırım, & E. Önder (eds), *Çok Kriterli Karar Verme Yöntemleri*, Bursa: Dora Basım-Yayın, 21-64.
- Ridder, D., and Pahl-Wostl, C. (2005), 'Participatory Integrated Assessment in local level planning', *Regional Environmental Change*, 5, 188-196.
- Rowe, G., and Frewer, L. (2000), 'Public participation methods: a framework for evaluation', *Science, technology, & human values*, 25, 3-29.
- Saaty, R. (1987), 'The analytic hierarchy process—what it is and how it is used', *Mathematical modelling*, 161-176.

- Saaty, T. (1988), 'What is the analytic hierarchy process?', in G. Mitra (eds), *Mathematical models for decision support*. Berlin, Heidelberg: Springer, 109-121.
- Saaty, T. (1989), 'Group decision making and the AHP', in T. Saaty (eds), *The Analytic Hierarchy Process*, Berlin: Springer 59-67.
- Saaty, T. (1990), 'How to make a decision: the analytic hierarchy process', *European journal of operational research*, 48, 9-26.
- Saaty, T. (2000), 'The seven pillars of the analytic hierarchy process', in M. Köksalan, & S. Zionts (eds), *Multiple Criteria Decision Making in the New Millennium*, Ankara: Springer, 15-37.
- Saaty, T. (2003), 'Decision-making with the AHP: Why is the principal eigenvector necessary', *European journal of operational research*, 145, 85-91.
- Saaty, T. (2008), 'Decision Making With The Analytic Hierarchy Process', *International Journal of Services Sciences*, 1, 83-98.
- Saaty, T., and Sodenkamp, M. (2010), 'The analytic hierarchy and analytic network measurement processes: the measurement of intangibles', in C. Zopounidis, & P. Pardalos (eds), *Handbook of multi-criteria analysis*, Berlin, Heidelberg: Springer, 91-166.
- Saaty, T., and Vargas, L. (2012), *Models, methods, concepts & applications of the analytic hierarchy process*, London: Springer Science & Business Media.
- Salter, J., Campbell, C., Journeay, M., and Sheppard, S. (2009), 'The digital workshop: Exploring the use of interactive and immersive visualisation tools in participatory planning', *Journal of environmental management*, 2090-2101.
- Selman, P. (2001), 'Social capital, sustainability and environmental planning', *Planning Theory & Practice*, 13-30.
- Taşan-Kok, T. (2012), Çok Aktörlü Yönetişim, in M. Ersoy (eds), *Kentsel Planlama Ansiklopedik Sözlük*, İstanbul: Ninova Yayınları, 85-86.
- Timor, M. (2011), *Analitik Hiyerarşi Prosesi*, İstanbul: Türkmen Kitabevi.
- Uludağ, A., and Doğan, H. (2016), 'Çok Kriterli Karar Verme Yöntemlerinin Karşılaştırılmasına Odaklı Bir Hizmet Kalitesi Uygulaması', *Çankırı Karatekin Üniversitesi İİBF Dergisi*, 17-47.

Wanga, A., Hub, Y., Li, L., and Liub, B. (2016), 'Group decision making model of urban renewal based on sustainable development: public participation perspective', *Procedia Engineering*, 1509-1517.

Wu, H., He, Z., and Gong, J. (2010), 'A virtual globe-based 3D visualization and interactive framework for public participation in urban planning processes', *Computers, Environment and Urban Systems*, 291-298.

Zhang, Y., and Fung, T. (2013), 'A model of conflict resolution in public participation GIS for land-use planning', *Environment and Planning B: Planning and Design*, 40, 550-568.

Appendix

The Focus Group Member List

The Focus Group Member Number	Profession
Member 1	Urban planner
Member 2	Town planner
Member 3	Water engineer
Member 4	Architect
Member 5	Architect
Member 6	Architect
Member 7	Cinematographer
Member 8	Biologist
Member 9	Physicist
Member 10	Interior designer
Member 11	MA in education
Member 12	Environmental researcher