Participatory urban planning through online webGIS platform: Operations and tools

Eleni Mougiakou, Commonspace co-op, mougiakou@commonspace.gr, Anastasia Christaki, Commonspace co-op, anastastasiax93@gmail.com, Giouli Athousaki, Commonspace co-op athousaki@commonspace.gr, Theodoros Vakkas, Geospatial Enabling Technologies, tvakkas@getmap.gr, George Velegrakis, Commonspace co-op, velegrakis@commonspace.gr, Pantelis Mitropoulos, Geospatial Enabling Technologies, pmitropoulos@getmap.gr, Thanos Andritsos, Commonspace co-op, t.andritsos@gmail.com, Dimitris Poulios, Commonspace co-op, dimipoul@gmail.com, Kostas Vourekas, Commonspace co-op, vourekas@commonspace.gr, Sofia Tsadari, Commonspace co-op, tsadari@commonspace.gr, Anastasios Manos, Dotsoft SA, tmanos@dotsoft.gr, Spyros Tzortzis, Sociality, contact@sociality.gr

ABSTRACT

This proposal refers to an online webGIS platform of participatory urban planning. It focuses on presenting the aim, the operations, and the tools of the platform, as part of an integrated system, in the context of ppCITY research project.

The development of Information and Communication Technologies (ICT) and especially WebGIS tools have lately contributed to public participation processes by enlarging the scale of participation of different stakeholders in urban design. This online platform technically relies on open source, ppGIS application solutions. It combines innovative online tools and supports necessary methodological steps of participatory planning, based on real spatial challenges. The platform encourages setting up projects and sub-projects to comply with the stages of participatory urban planning, harnessing libraries of proposed solutions, and combing user profiling and opinion weighting.

The primary purpose of this platform is to highlight the essential features of public space and to organize the steps for equal and meaningful participation of citizens in urban planning. This research in progress visions to create a community of users, experts, designers, and developers around an open source ppWebGIS software.

CCS CONCEPTS

• **Applied computing** → **Computers in other domains** → Computing in government → *E-government*

KEYWORDS

ppCITY, ppGIS, WebGIS, platform, participatory design, public space, libraries, urban planning

1. BACKGROUND

Participatory planning has been rapidly developed during recent years. As Landscape and Public Participation (PP) guide for landscape catalogues in Catalonia defines, public participation is the collective or individual intervention of citizens in public matters. In this way, its main purpose is to make sure that political decisions take into consideration public opinion and create a social consensus around any common good subject. [1]

In order to practice public participation, a series of methodologies have been developed in every PP project, that turn ideas and questions (what project?, why?, when?, who are the participants?) into actions [2]. In a wider scale, Creighton divides every participatory project in three phases: decision making, planning and implementing [3]. In any occasion, Dr. Nikki Slocum, Research Fellow at UNU/CRIS suggests the following five elements that one has to take into account to choose methods to apply: Objectives, Topic, Participants, Time, Budget. [4]

A series of online tools and platforms have been developed in order to serve the methodological steps and needs of communities, municipalities, and services, in participatory place making, public space design, planning etc. According to Somarakis and Stratigea, the wide spreading of Information and Communication Technologies (ICT) has also reinforced participation in public space planning, in two levels: 1. Support the development of e-planning and 2. Make the online public participation easier in different phases of spatial planning [5].

The main categories of participatory platforms are 1. collective mapping, 2. collective planning, 3. expert knowledge and 4.

ICEGOV2020, April 1-3, 2020, Athens, Greece

ACM ISBN 000-0-0000-0000-0/00/00…$15.00
https://doi.org/00.0000/0000000.0000000

consultation and confirmation of final plans [6]. Some of the most relevant online participatory platforms are presented in the Table 1.

Table 1: Table of online platforms of participatory mapping and planning

PLATFORM	DESCIPTION	STRENGTH	OPEN SOURCE
Maptionnaire [7]	A SaaS platform that helps urban planners and citizens to decide on plans on a greater scale of urban planning.	Questionnaires on a map. Data collection	NO
Mapping for Change [8]	A Platform of participatory cartography that creates maps of visualized data. These maps can compare information and open a dialogue about urban nods in the community.	Participatory process. Community mapping	NO
mySidewalk [9]	A tool used by local authorities (municipal authorities, regional councils etc.) in order to collect and understand spatial and social data for urban areas.	Decision making, project progress, data-driven story. Dashboard.	NO
Smartcitizen [10]	A platform that focuses on environmental data and actions, and helps communities to study about their natural environment and the ways of protecting it.	Environmental monitoring, co-design. Real time data from sensors. Arduino.	YES
Commonplace [11]	A platform that focuses on local participation, on participatory planning of smaller scales,.	Open local engagement	NO
Community PlanIt [12]	An online gaming platform that encourages citizens and different stakeholders to participate in urban planning.	Gaming, co-creation of spatial policies	YES

The platform presented in this paper is an open source software, supporting participatory planning and design projects horizontally (not field-specific). It provides tools, knowledge, and concrete steps for equal and meaningful participation of citizens and users. It promotes structured processes for the analysis and selection of appropriate design solutions, proposals, and ideas. Also, it can prioritize measures and technical works. Finally, the platform supports opinion weighting. The participants are invited to engage in all the phases of the process.

1.1. Introduction. The ppCITY project

The platform presented in this paper is part of ppCITY research project. ppCITY develops an integrated participatory network of three platforms that include ppGIS technologies, data from sensors and other sources, crowdsourcing methods, IoT and the integration of social media.[13]. In the ppCITY research project the research team is developing an Integrated Spatial Decision Making & Public Participation System, focusing on citizens, environment and quality of life. The engagement and participation of "general public" and the users of the public space is essential for the whole process.

The system consists of three (3) platforms for management, interaction and analysis. The final product is a modular unified system. This paper focuses on the operation of the online platform of participatory urban planning (Platform 2). The primary purpose of this platform is to highlight the essential features of public space and to organize the steps for equal and meaningful participation of citizens in urban planning.

2. PLATFORM' S SYSTEM AND DATA

This Platform consists of a unique system of planning and design application, including several innovative features. It provides tools of participatory planning through WebGIS technology and takes as input data and results from the other two online platforms. The system inputs data from the other platforms using network services and provides mapping environment with visualized data. It is being developed from scratch.

It can be seen as a content management system enriched with spatial capabilities. An ecosystem of functions and capabilities are encapsulated on the system, focusing on enabling the participation techniques. Spatial questionnaires, customizable libraries of proposed solutions, good practices, forum, opinion weighting/ expert judgement, social media integration are some of the key features of the platform.

2.1. Platform's operations

Without setting aside the importance of the physical presence of the community stakeholders to the participatory processes, the WebGIS platform aims to reinforce them.

The methodological steps/phases followed in the ppCITY project are 1. Understand space according to users' experience (empirical data collection) 2. Perform Spatial SWOT/ PEST/ Risk analysis 3. Support brainstorming workshops 4. Lectures of specialized knowledge through libraries 5. Participatory planning and design of users' functional space 6. Workshops of final design proposal 7. Public consultation of the final plan. The workflow and operation flow of the platform are presented in Figure 1.

Urban planners, municipalities, and other organizations can start a new project in the platform and input necessary data about the project and the area that they plan. The design team performs field and desktop research, collaborates with the competent agencies, and collects legal framework and existing plans for the study area.

The planners/designers draft the planning objectives (related to the public participation goals) and configure the project and subproject in the platform (back end). At the same time, the stakeholder analysis is performed, and the appropriate key-persons (agencies, experts, or the general public) are invited through e-mails or predefined usernames (e.g., for students) to participate. The project is published online, and the communication campaign supports the whole project. Primary goals of e-communication are to reach the appropriate audience, to share ideas and results, to raise public awareness.

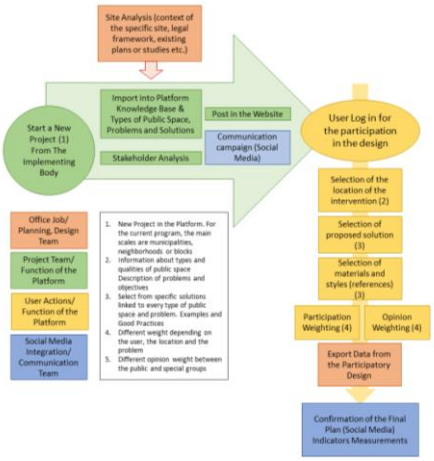

Figure 1: Platform's workflow

The participants log in to the specific project/subproject that they want (or are invited) to engage. The participants chose the area or subarea they want to express their opinion or idea, and a step by step procedures guides them through the planning/design process. During the log in, the participants answer a few (1-3) questions that build their consultation profile. The consultation profile supports the opinion/participation weighting. The collected data can be exported in different formats for the planners to draft the final proposals. A new round of consensus, consultation, and approval begin.

The public participation phases follow the design phases and are supported by the platform's projects and sub-projects. The basic platform's operations according to the stages of participatory urban planning are the following:

At the first stage (e.g. Project 1: Wider area analysis. Subproject: a. Neighborhood recognition b. Route identification c. Analysis of selected areas) :

- It highlights the values and features of public space. It helps urban planners to come out with an analysis of the current state of public space which will be designed.
- The platform provides features of the space identity from data such as environmental, social, traffic data that takes as an input from the other online platforms and other sensors and sources.
- By logging in the platform, according to their consultation profile, stakeholders, citizens and other users express their opinion about their functional area, by answering to an integrated structure of spatial questionnaires.

At the second stage (e.g. Project 2: Urban and Bioclimatic Design of a plot. Subprojects: a. The surrounding area b. The building c. The entrances) :

- WebGIS platform supports processes for the analysis and selection of appropriate design solutions, proposals and ideas, in specific urban areas and according to real spatial problems.
- Users choose the spatial solutions that they would like to implement, according to their role.
- The online platform weights and prioritizes the opinion of simple users and experts, who are invited to participate in all the phases of the process.
- The proposed projects and actions are "forwarded" to the users through a targeted and structured communication campaign to ensure increased participation of appropriate population groups.

The platform exports the data and the final plan can be confirmed through social media by public approval.

2.2. Platform's Variables

The platform categorizes a set of online variables that refer to the ongoing project, the plot, or the area that will be designed. The researchers can define those variables according to their needs when they start a new project. Variables help researchers to define spatial problems and solutions, and users to understand public space features and choose among proposed solutions. Variables and sub-variables define every project.

For example, the ppCITY research team is organizing a pilot program of participatory planning on a plot in Sepolia neighborhood, in Athens. The main challenge is dealing with the urban heat island effect according to C40 proposal and creating a cooling centre for the neighbourhood by proposing particular design ideas. The research team defined the main project 'A cooling centre' and sub-projects, such as 'the surrounding area.' An example of the variables of this pilot project is presented in Figure 2.

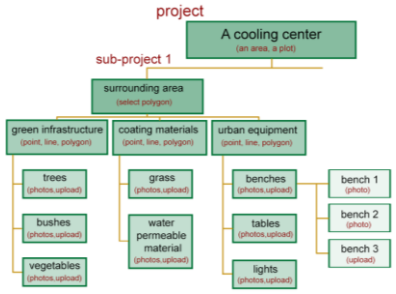

Figure 2: Variables and sub-variables of sub-project 'Surrounding area'

Each variable can take a value as a point, a line, a polygon, a photo, a Pdf, or a Sub-variable. Users can answer to sub-variables

by drawing dots, lines, and polygons on maps, selecting existing geometries, and by choosing among photos. They can even upload their pdf or image and approve (like) other users' answers.

2.3. Platform's tools: Libraries

The platform also runs a series of online tools that can be used during the different stages of participatory urban planning. The basic ones are different data libraries. They operate as an input from a data portal. They consist of an integrated system of data sets and knowledge libraries. Every item in the library can be defined as an image, pdf, URL, reference, and it belongs to a wider category according to its subject. The basic libraries are the followings:

- **Typologies of problems and solutions:** It includes problems and solutions of different public space typologies. Every type of space comes with the problem and a proposed solution according to the basic methodology of urban design. For example, a narrow street and some planning solutions. This can help amateur users understand the different features of urban space and the way that every problem can be solved.
- **Libraries of good and bad practices:** It consists of international examples of bad and good practices in different issues of urban planning. For example, it includes dangerous playgrounds and well-designed ones, bad and good examples of urban equipment. They appear in the subprojects' variables. They can help users that are not experts to get in touch with urban planning, so that they can choose among spatial solutions later.
- **Library (toolkit) of spatial solutions- proposals:** In this library there are spatial solutions such as plans, photos of urban equipment and materials. Users choose among them in order to shape their final design proposal.

2.4. Platform's technology and software

The system will be available as Free and Open Source Software (FOSS). Php programming language, ReactJS, Openlayers, PostgreSQL/PostGIS are the foundation components.

The platform database is fully managed and queried using a custom RESTful API written in PHP 7.3. PHP 7.3 (~3x faster than PHP 5 and with comparable performance of low level languages) matches the database design demand for performance, even on cases of high number of concurrent requests. The front-end User Interface (UI) is being built using ReactJS with Redux. React provides a robust and lightweight UI, enhancing at the same time user experience through its special way to treat DOM. UI communicates with the RESTful API.

3. CONCLUSION AND FUTURE WORK

This online platform is still in progress. Its final form will be launched in May 2020. Two pilot programs will take place in Athens and Thessaloniki to test the platform's performance and record user acceptance. The ppCITY research team is conducting the pilot projects in order to test the platform and collect useful data about its operation.

Different uses of this public participation platform, regarding participatory urban planning and design, according to experts' opinion (meetings, focus groups, questionnaires, interviews performed by the research team) are: 1. Data collection (e.g. public space quality, routes, and transport in the city, socioecological values of green spaces, adaptive capacity, landscape values, etc) 2. Local and regional plans/strategies of "Adaptation to climate change" 3. Sustainable Urban Mobility Plans (SUMP) 4. Master plans 5. Urban regeneration 6. Urban green planning 7. Expert judgment support 8. Criteria weighting for multicriteria analysis.

There is a gap between the Greek audience regarding spatial thinking and understanding. More effort on soft skills of participation and expressing opinions on a map is necessary.

ACKNOWLEDGMENTS

Research for this paper benefited by the "Integrated System for the Spatial Decision Support and Participation Planning" project, with the acronym "ppCity" ", co-funded by the European Union and the European Regional Development Fund under the Single State Aid for Research, Technological Development & Innovation "Research -Create- Innovate" of the O.P. "Competitiveness, Entrepreneurship and Innovation (EPANEK)", NSRF 2014-2020. The authors are very grateful to the Resilient officers of the municipalities of Athens and Thessaloniki for their valuable help, comments and support during the project's pilot.

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