ISLAND AREAS: CREATING A WEB APPLICATION FOR ENHANCING PUBLIC PARTICIPATION IN SPATIAL PLANNING

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Abstract

Spatial planning should be environmentally sustainable, economically fair and reliable and socially desirable. However, individual choices and social disputes influence significantly decision making in spatial planning. Therefore, spatial planning should be a flexible to be modified depending on each area's needs, requirements and characteristics. It is required to establish a new model of governance to design spatial planning policies according to the needs and beliefs of local society and also eliminating the long-prevailing liabilities the Greek spatial planning institutional framework presents.

This study proposes an effective and user-friendly web-application able to incorporate local communities' priorities in designing the operational programme of a Greek island Municipality. The tool proposed improves the reliability and the effectiveness of spatial planning policies and minimizes the conflicts between all social groups, contributing in this way towards Greek islands' sustainable development.

In order to achieve these objectives were used many state-of-the art techniques, such as a map based commenting tool, online questionnaires and Geographical Information System software.

Key words: Public Participation, Spatial planning, Sustainable Development, PPGIS.

1. Introduction

1.1 Spatial planning and public participation

Spatial planning is the means to ensure the sustainable use of natural resources. Therefore, local society should be encouraged to participate in decision making process, according to United Nations Environmental Programme (UNEP, 2014). This approach aims to enhance the active involvement of citizens to reassure the maximum possible consensus on policies planned (Grammatikogiannis and Giaoutzi, 2011). Public participation enables the minimization of conflicts among all social groups and consequently improves the reliability and effectiveness of spatial policies followed (Eliott et al., 2005). Consequently it is necessary to create a framework of governance based on a synthetic and comprehensive series of negotiations (Kuttler and Ulbert, 2008). Decision making needs to be a versatile process, flexible enough to be adapted on the needs, requirements and characteristics of each area (Areizaga et al., 2012). Spatial planning is a crucial parameter also to achieve sustainable development due to the fact that the funds available are limited while development remains a challenge. These conditions are even more critical in islands where National States traditionally invest limited funds.

In Greece land policy provides limited opportunities for public participation and rarely takes into account social factors. As a result the majority of land use plans applied have limited effectiveness. Future spatial planning policies should include *"dialog between government, local society, NGOs, business and scientists/experts on a particular decision or a problem"* (Renn et al., 1993). Through the involvement of these actors in policy making, is argued that an agreement is possible to be reached. This new model of government in spatial

planning requires administrative changes to deal with the liabilities the Greek spatial planning framework presents such as centralized planning approach, corruption, sub-representation of particular interests, weak involvement of local society, inadequate mechanisms to encourage participation and veiled dialogue (Sapountzaki and Wassenhoven, 2005; Coccosis et al., 2005).

To achieve sustainable development in islands, spatial planning policies should be environmentally sustainable, socially desirable and economically fair and reliable (Kuttler and Ulbert, 2008). As a result, it is necessary to redefine spatial planning structures and processes followed in both local and regional scale in Greece to establish policies based on the demands and desires of local communities by proposing a new model of governance for spatial planning. Creating user-friendly web-applications to enhance public participation is a way to achieve this goal.

Designing systems to strengthen public participation is of high importance especially when considering that spatial planning is influenced by individual choices and social disputes (Eliott et al., 2005). The use of this kind of systems may contribute in solving few of the most important long-existing problems of spatial planning in Greece such as the lack of public confidence in political institutions and the negative perceptions about politic system However, a number of researchers (Swyngedouw, 2000; Sorensen and Sagaris, 2010) states that community involvement in decision making may lead to manipulative orchestrations and therefore the terms defined are imperative to ensure transparency during deliberation processes.

1.2 Literature review

Public opinion is a valuable source of information that should contribute to an improved quality of the analysis methods followed (Bugs et al., 2009). According to literature, the evolution of the information technologies software in combination with the development of new web-tools provides the opportunity to persuade communities to participate in forming the priorities of spatial planning policies (Bizjak, 2012). In this frame, several participatory planning attempts were ventured using Public Participation Geographic Information System (PPGIS) (Ramasubramanian, 2008). PPGIS are able to *«incorporate the notion of participation in geographic information systems and then develop the interactive platform for people to deliver information»* (Chou, 2007). Recent advances in Web 2.0 and Geographic Information Systems (GIS) software, such as Google Earth and Google Maps (GMaps) are already commonly adopted (Bugs, 2009), providing new methods to create advanced web applications and improved PPGIS (Bugs et al., 2009).

As a result, over the last years many attempts are recorded to design applications able to enhance participation of communities in decision-making in various research fields. However, online public participation is a research field which is thought to be young (Rucker and Whalen, 2012). Labiosa et al. (2013) created a Web-DSS (Decision Support System) application which besides ecological and economic criteria takes into account local society's opinion to prepare land-use plans, using relevant forms. Janssen et al. (2008) developed a DSS based on genetic algorithms able to facilitate managing data from different sources. Schetke et al. (2012) incorporated a DSS and multicriteria analysis methods using vector layers, to prepare or revise land use plans. Grammatikogiannis (2011), created a platform which provides information to users and record their comments. Particular interest presents "Virtual Slaithewaite" which is one of the first PPGIS applications that allowed a two-way flow of information (Poplin, 2012).

1.3 Sustainable development and islands

Development initiatives in Greek islands are able to become nuclei of development in case they are used in accordance with the principles of sustainable development. However, each island's model of development is influenced by its particular geographic, economic and social characteristics. Key role in this process has a phenomenon of geographical discontinuity, named insularity, whose effects every development strategy tries to deal with. According to literature (Mergos et al., 2005; Papadaskalopoulos et al., 2005) insularity is a phenomenon that causes problems in both social and economic background of the islands and also hinders their process towards achieving sustainable development. Insularity is a phenomenon that

intensifies inversely with the size of the island and depends on the island's distance from the coast (Mergos et al., 2005; Koutsopoulou, 2013), while the problems caused are characterized as structural and therefore permanent (Papadaskalopoulos etc., 2005). It also contributes in market fragmentation and island isolation, factors regarded to be key causes of the regional problem (Konsolas, 1997). Insularity also affects adversely numerous development parameters such as labor market, production costs, transportation, communications (Papadaskalopoulos et al., 2005). The scale of the effects of insularity are depended on many natural and socio-economic factors, such as geographic and social isolation, limited access to services and productive resources, seasonal fluctuations in the economy and particular demographic features (eg. aging population) (Koutsopoulou, 2013).

1.4 What is an island?

Although in literature are recorded several attempts to define of the term "island", there does not exist a definition unanimously accepted. The term "island" comes from the Latin word "insula" (isolation), while the Italian word "isola" derives from the verb isolare (isolate), leading to the conclusion that the term "island" is associated with the terms "limit" and "restriction".

In a simplistic way island is *"every parcel of land that has no land borders"* (Papadaskalopoulos et al., 2005). Islands to be considered are those which *"area exceeds 1 sq.km, population exceed 50 inhabitants, are remote of more than one kilometer from continental territories"* (ESPON, 2011). However, literature acknowledged the limitations of the above definition, (e.g. islands located less than 1 km from the mainland but present similar characteristics and problems). European Spatial Planning Observation Network (ESPON) at "Eurisles" report (1997), tried to define the term "island" using quantitative criteria, and concluded that island is an area that *"has a surface of at lest 1 km^2, has a statistically significant permanent polulation (at least 50 inhabitants), is not connected to the mainland by permanent structures, is situated at least 1 km from the European mainland, is not containing the capital of a Member State"*. ESPON at the 5th Report on European Cohesion (E.C., 2010) defined as islands *"Nuts 3 regions, where the majority of the population resides in one or more islands, without being permanently connected to the mainland (e.g. bridge or tunnel)"* (ESPON, 2011).

1.5 International strategies for islands

Policies focused exclusively on islands begun to be recorded at the seventeenth chapter of Agenda 21 (United Nations, 2011) where islands are considered as *"discrete spatial units with specific economic, social and environmental characteristics"*, that require discrete designed development strategies (Tsaltas, 2005; Koutsopoulou, 2013).

United Nations (UN) through the Declaration of Barbados (United Nations, 1994) acknowledged that the most important advantages for the development of small islands are cultural heritage and human resources (Karageorgou, 2005). Promoting cooperation in both international and regional scale and integrating environmental concerns into sectoral policies are regarded to be key principles in achieving harmonious relationships among environment, economy and society.

UN (Mauritius Strategy, 2005) tried to improve the implementation of the policies established through a Action Programme for the Sustainable Development of Small Island Developing States. This constitutes the unique world-class strategy to tackle the problems of small island states (Koutsopoulou, 2013). Basic parameters of the programme were regarded to be natural resources and natural hazards, economic and social issues, governance issues and ways of policies implementation.

1.6 European strategies for islands

Although there have been established policies which affect islands' sustainable development (e.g. policies on agriculture, entrepreneurship, natural and cultural heritage, human resources and services, infrastructure) European Union (EU) has not established yet a policy regarding exclusively EU islands areas.

According to EU (Blue Plan Notes, 2012) key priorities to incorporate environmental concerns into sectoral policies are water resources management, waste treatment facilities, environmental pollution and overpopulation of the coastal areas (Karageorgou, 2005). It

should be underlined thought, that these policies concern the whole Mediterranean basin and are not focused on islands or island areas.

Other institutional documents of critical importance for the development of islands are the National Strategies for Sustainable Development (2000) (Minenv, 2002), the EU's Protocol on Integrated Coastal Zone Management (2008) (EU, 2010) and the Mediterranean Strategy for the Water resources (2010) (Koutsopoulou, 2013). To protect and develop island areas in a sustainable way, EU proposed the strategy "Islands 2020", which classifies islands in three categories and defines a vision for their sustainable development (Spilanis et al., 2011). The categories are:

- Quality islands. Their development should be focused on quality-branded products using in a sustainable way local resources.
- Green islands. Their development should gradually try to reduce the use of their scarce resources and should promote strategies to increase their reuse of their resources if possible (e.g. water, soil, energy).
- Island with equal opportunities. Their development should aim to create islands with the similar development priorities existing at mainland areas.

It is obvious that EU policies face the development of island areas in a partial way, an approach that affects significantly both social and economic cohesion of the Community.

1.7 National strategies for islands

"Special Planning Studies" are the main efforts of the Greek State to achieve spatial sustainable development in islands. Their application though is occasional and their effectiveness is limited. Main cause of these problems is the weakness of the institutional framework to integrate the environmental dimension in development initiatives (Coccossis and Mexa, 2002). Indicative of the fragmentation of the Greek legislation concerning this matter is that only those islands fully belonging to Urban Control Zones are subject to some kind of planning regulations (Lagos and Stamatiou, 2004).

Regarding sustainable development in islands, the basic principles set out in these are "*retention of a viable population number, protection and exploitation of resources, the recognition of the islands as an integral part of natural and cultural heritage of the country, recognition their ecological uniqueness, exclusive promotion of quality development, planning of land uses in accordance with the national development objectives, protection of their natural resources by the objectives of regional development and regional policy*" (Lagos and Stamatiou, 2004).

The Law 2742/1999 entitled *"Spatial planning and sustainable development and other provisions"* promoted the formation of the General and the Special Frames for Spatial Planning and Sustainable Development. However, in recent years Greek State in an effort to attract investments, particularly in tourism sector, provided investors with too many motives, while the assessment of all social, economic and environmental impacts of the investments proposed has become of secondary importance. These laws and policies often ignore many crucial problems which island communities have to deal with and often hinder the development of Greek islands. Characteristic examples are the Law 4179/2013 entitled *"Simplifying Procedures for Enhancing Entrepreneurship in Tourism"* and the Law 3894/2010 entitled *"Accelerating Slide and implementation of investment strategies"* which in combination with the –under revision- Law 2971/2001 entitled *"Seashore, beach and other provisions"* and the already revised Special Frame of Planning and Sustainable Development for Tourism (Joint Ministerial Decision 67659/B/12.12.2013) constitute an institutional framework that ignores many crucial problems that hinder Greek islands' development.

1.8 Operational Programs

According to Greek legislation, every Municipality has to prepare an operational programme to be financially supported by EU funds . Operational programmes are five-year plans, whose main goal is to evaluate the municipality's strengths, weaknesses, opportunities and threats to propose a number of projects and policies to develop the municipality in a sustainable way. The policies proposed have to be harmonized with the priorities of the General and the Special Frames for Spatial Planning and Sustainable Development. The

stages of elaborating an operational program are (Municipality of Molos, 2011) according to Greek legislation are Stage A: Mapping and evaluation of the internal and external environment of the local authority-strategic planning, Stage B: Strategic plan's approval and consultation, Stage C: Operational Planning, Stage D: Final procedures.

2. Materials and Methods

2.1 Characteristics of Greek islands

Greece has a total area of 131,957 sq. km. and a coastline of about 15,000 km which is the most extensive among Mediterranean countries (Coccossis and Mexa, 2002; Spilanis et al., 2011). Greek islands and islets are more than 3000, the majority of which is sited in the Aegean Sea, occupying 19% of the Greek territory. There are different types of islands regarding their extent, natural environment, population and socio-economic characteristics. Indicative is that few islands have a population of more than 10.000 residents and only four of them exceed 100.000 residents (Crete, Evia, Corfu, Rhodes) (Coccossis and Mexa, 2002). Greek insular prefectures (North Aegean Prefecture, South Aegean Prefecture, Ionian Islands Prefecture, Prefecture of Crete) occupy 14.97% of the Greek territory and 12.06% of the Greece's total population. Another crucial characteristic of these prefectures is that they are border areas of both Greece's and EU (Mergos et al., 2005; Spilanis et al., 2011).

2.2. IM_PPOP application

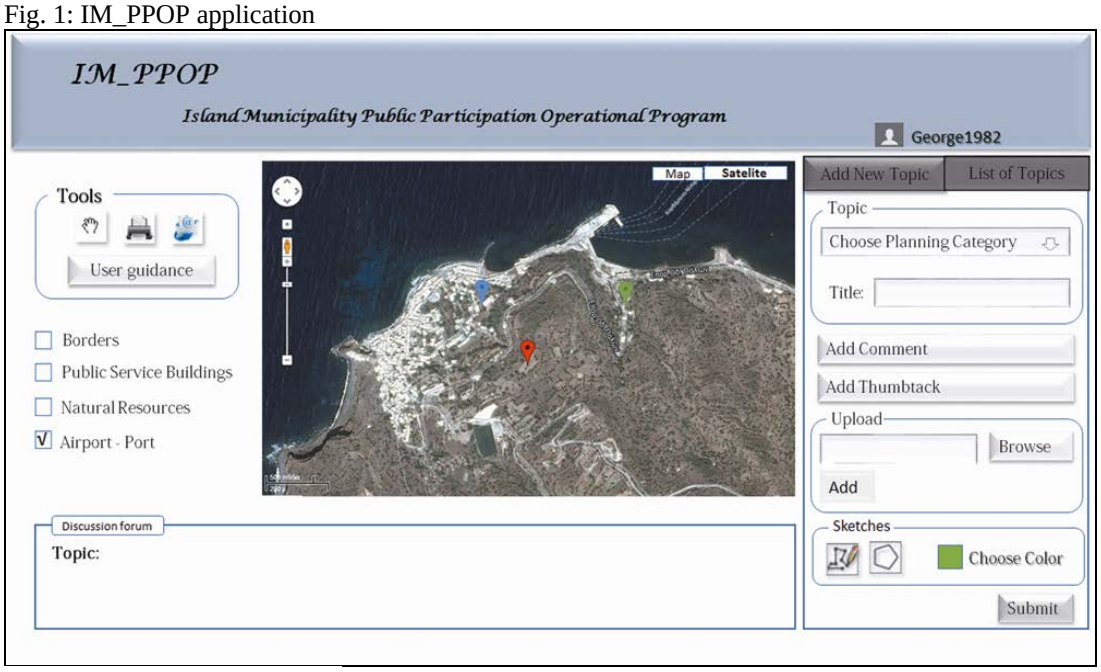
Designing systems to enhance public participation in decision making process is of high importance, especially regarding island areas that are usually isolated and away from decision making centers. Main goal of this research effort is to develop a user-friendly application web-based application named "IM_PPOP" (Island Municipality_Public Participation Operational Programme). Main goals of the application proposed are to establish a new model of decision making to ensure public participation in order to steer islands' future development towards sustainability priorities. This web-application contributes in designing the operational programme of an island Municipality, based on local community's demands, beliefs and desires. To achieve these objectives are used a map-based commenting tool, online questionnaires, user guidance software and social networking software (Fig. 1). Each of these tools is described in detail below.

- ✓ ***Map based commenting tool***: This tool combines a commenting tool with geo-visualization techniques. Users are able to make comments while at the same time the visualization of their Municipality facilitates the whole process.
  - ***Geo-visualization techniques:*** Spatial data visualization is accomplished by «*embedding a mapping viewer in the browser*» (Bugs et al., 2009). There are many mapping services such as Google Maps (GMaps) and Open Street Maps (free data and collaboratively created), which provide the services required. The "IM_PROP" application integrates a mapping viewer to the web browser using GMaps. Users are also able to choose whichever GIS data layers they prefer to de displayed (e.g. neighborhoods, borders, roads, public service buildings, natural resources, etc.) so as to develop a comprehensive opinion about the topic in which they are interested in.
  - ***Commenting Tool***: This tool enables users to submit and share their opinion. Specifically, users are able to (i) choose a planning category (health, culture, education etc.) from a list by selecting the proper icon, (ii) entitle their comment, (iii) submit their opinion using the comment submission form, (iv) add optionally a Thumbtack to the place related to their comment. Each Thumbtack will be in a different color depending on the planning category in which it belongs to. There is also the opportunity to prepare sketches on the GIS map and send images to the administrator. When users submit their comments, automatically a new discussion forum topic is generated. On the right of the screen users may find a list of all the discussion topics already created. Users are able to choose a topic or choose a Thumbtack on the map if interested in a specific area. When choosing topic, an online discussion forum appears and users are able to add a feedback comment. All discussions

are organized and illustrated in order to be supported among participants a transparent discussion environment.

- ✓ ***Online questionnaires:*** Users are invited to answer in a series of questions. These online questionnaires aim to evaluate and improve the effectiveness of the "IM_PPOP" application and simultaneously are a way to repair the system's flaws.
- ✓ ***User guidance:*** In order "IM_PRP" application to be used properly there should be available a user guidance tool to serve as a companion resource in spite of the application's user-friendly environment. Users are able to seek information about the application's functionality through video-tutorials.
- ✓ ***Social networking:*** Despite all the methodological advances of the PPGIS, obstacles concerning efficient public participation have not been significantly changed until today (Brown, 2012). To create groups that may spread the information quickly the application should be related to social networking (e.g. Facebook, Twitter, Myspace etc.), providing in this way «*individuals to become part of the larger political process*» (Liu T., 2013). Therefore, "IM_PPOP" application was linked with the advantages that social networks provide. As a result spatial planning principles may be disseminated to island municipalities and consequently a wider range of citizens' demands and desires may be revealed.
- ✓ It should be underlined that "IM_PPOP" application will be accessible only to logged-in users. Users is possible to be registered only the residents of the municipality examined by inserting as password their "resident registration number". During the registration process every citizen has to provide the administrator with a valid e-mail account, a user name and also personal information such as sex, age, profession, and residence. The above information is necessary to achieve an effective statistical analysis of the users' profiles. Zed Attack Proxy (ZAP) was used to reassure the safety of the data inserted. Using ZAP were performed penetration tests and security vulnerabilities were found and fixed.

Fig. 1: IM_PPOP application



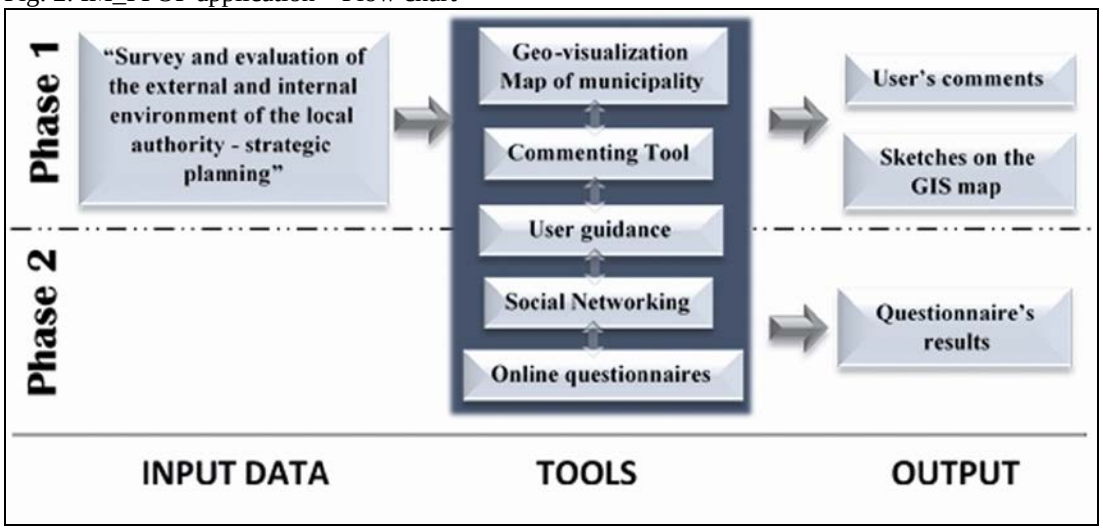
3. Results and discussion

The "**IM_PPOP**" application divides the process of designing an operational plan in two different phases (Fig. 2). The **first phase** is called "**SPA_PP**" (Strategic Plan Approval_Public Participation) and starts simultaneously with the stage of "strategic's plan approval and consultation" of the operational programme. In this phase, the results of the stage of "mapping and evaluation of the internal and external environment of the local authority- strategic planning" of the operational programme are uploaded and are available to the users. In the next phase users are able to use the map based commenting tool.

This phase aims to investigate the opinion of local citizens on the strengths, weaknesses, opportunities and threats which they believe that should be assessed during designing the operational programme. This will be a useful source of information during strategic plan's consultation process. The "SPA_PP" phase ends when the "strategic plan's approval and consultation" is completed. Many tools are provided to facilitate the navigation–visualization of the users such as zoom-pan tool. They can also print and e-mail files or label comments to express their opinion, ask a question or make suggestions about specific features of the map or of the results of the operational programme.

The **second phase** of the application is called "EPP" (Evaluation of Public Participation) and aims to evaluate whether local society's demands and desires were taken into consideration in decision making. This phase commences after the completion of the first phase and ends with the completion of the operational programme. The effectiveness of the public participation process will be evaluated using questionnaires concerning the users. Specifically an e-mail will be send to each user to ensure their participation at this phase. Finally all the data will be analyzed and the results will be uploaded to local municipality's website.

Fig. 2: IM_PPOP application – Flow chart



4. Conclusions

Over the last decades many research attempts have been recorded to design applications to enhance the involvement of local communities during deliberation processes. However, online public participation in spatial planning is a research field which is thought to be young. Despite all the recent methodological advances many obstacles have to be yet overcomed to ensure remarkable public participation. Public opinion is a valuable source of information able to ameliorate the effectiveness of the policies followed. Unfortunately, spatial planning in Greece until today rarely took into consideration the beliefs and opinions of local communities. To achieve sustainable development, spatial planning policies should be based on a participatory, synthetic and comprehensive series of negotiations, based on each area's characteristics and resident's beliefs. Therefore is required to redefine the model of governance implemented.

This research proposed a user-friendly web-application, named "IM_PPOP" that ensures the involvement of citizens to incorporate local communities' priorities in designing the operational programme of a Greek island Municipality. The methodology followed is based on state-of the-art techniques to enable citizens to submit and share their opinion and to evaluate and improve the effectiveness of the application established.

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