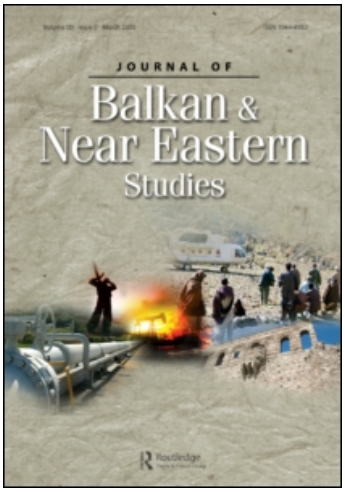

Journal of Balkan and Near Eastern Studies
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713435906

Using participative GIS and e-tools for involving citizens of Marmo Platano-Melandro area in European programming activities

Beniamino Murgante[a]; Lucia Tilio[b]; Viviana Lanza[b]; Francesco Scorza[b]
[a] LISUT, DAPIT, Facoltà di Ingegneria, Campus di Macchia Romana, Potenza, Italy [b] Laboratory of Engineering of Urban and Territorialsystem, University of Basilicata, Potenza, Italy

Online publication date: 21 March 2011

To cite this Article Murgante, Beniamino , Tilio, Lucia , Lanza, Viviana and Scorza, Francesco(2011) 'Using participative GIS and e-tools for involving citizens of Marmo Platano-Melandro area in European programming activities', Journal of Balkan and Near Eastern Studies, 13: 1, 97 — 115
To link to this Article: DOI: 10.1080/19448953.2011.550809
URL: http://dx.doi.org/10.1080/19448953.2011.550809

Journal of Balkan and Near Eastern Studies,
Volume 13, Number 1, March 2011

Routledge
Taylor & Francis Group

Using participative GIS and e-tools for involving citizens of Marmo Platano–Melandro area in European programming activities

BENIAMINO MURGANTE, LUCIA TILIO, VIVIANA LANZA and FRANCESCO SCORZA

Introduction

Traditional methods adopted in planning and programming activities have been developed in periods when society was less dynamic and complex. Such approaches led to defining the future evolution of a territory in great detail.[1] The application of these methods in the current context of socio-economic transformation coupled with abrupt changes due to technological innovation, globalization and recent financial crisis contributed to the creation of a sort of 'suspiciousness' about planning and programming activities. Plans following such assumptions based their success on a faithful execution of planning instruments,[2] but the extreme mutability of today's socio-economic contexts may lead to the risk of discussing once again the location choices made many years before.

In the present work, we use the 'programming' term to denote all government tools regulating the public economic investments for local development. In particular, we considered the hierarchy of intervention tools at different scales promoted by EU policies in different sectors: regional convergence, environment, education, social capital, etc. In our opinion, the programme is a particular part of planning activities connected more to economic resource management than to physical territorial dimensions. Programming activities influence territorial planning at different scales, but also implement several actions not directly connected to territorial transformations. For this reason, it is relevant to distinguish between the two terms.

Since the 1960s, different approaches to strategic planning have been theorized. The main difference can be found in a sort of transition from a purely top-down approach to a 'reticular interactive' one, where the knowledge and imagination of society play a fundamental role in order to discover desirable scenarios.[3] Such differences define three major families of strategic

[1] R. Camagni, 'La città come impresa, l'impresa come piano, il piano come rete: tre metafore per intendere il significato del piano in condizioni di incertezza', in F. Curti and M. C. Gibelli (eds), *Pianificazione strategica e gestione dello sviluppo urbano*, Alinea, Firenze, 1996, pp. 83–98.

[2] L. Mazza, 'Descrizione e Previsione', in S. Lombardo and G. Preto, *Innovazione e Trasformazioni della Città, Teorie Metodi e Programmi per il mutamento*, Franco Angeli, Milano, 1993.

[3] M. C. Gibelli, 'Riflessioni sulla pianificazione strategica', in R. Rosini (ed.), *L'urbanistica delle aree metropolitane*, Alinea, Firenze, 1992.

ISSN 1944-8953 print/ISSN 1944-8961 online/11/010097-19 © 2011 Taylor & Francis
DOI: 10.1080/19448953.2011.550809

plans.[4] The first family, largely used during the 1960s and 1970s, was based on a top-down approach and essentially referred to the rational comprehensive approach to planning. In the 1980s, a short-term approach to strategic planning was adopted. It was based on corporate planning, implying a pragmatic behaviour which may lead to a strong territorial deregulation. In the 1990s, a reticular and visionary approach to strategic planning was used. According to Harvard[5] and Minnesota models,[6] SWOT analysis plays a central role in order to examine internal and external environments,[7] producing also a stakeholder analysis considering organizations, groups, persons and all citizens, who can have a key influence on strategic processes. Other important aspects of this family of strategic plans are:

- the development of a vision for the future;
- the identification of general goals and specific objectives;
- the definition of strategies (how they actually fulfil goals and objectives);
- the evaluation of the progress of the action implementation of strategies.

This family considers strategic planning as a form of governance implementation. This concept represents a new approach to public administration. There has been a transition from an approach based on direct action (Government), where the Local Authority contributes directly to problem solution, to another approach where the Local Authority tends to manage the process (Governance),[8] where the administration makes possible and facilitates a search for different solutions, in cooperation and agreement with other public and private subjects.[9] Obviously, in case of changing contexts, iterative processes are possible and flexibility is also crucial to avoid bureaucratization. The 'reticular' term means that the strategic plan cannot be implemented only by a single local authority, but by a group of different levels of public administrations (be they elected by citizens or not). This term means also that there is the widest possible involvement of all potential stakeholders in order to avoid possible conflicts which could stall the whole process and, above all, to create a broad and shared planning vision. Visioning concerns not only actors, who can be represented by institutions, but it also considers the possibility that collective knowledge and imagination may stimulate a search for optimal solutions. Such interactivity, aiming at a wide stakeholder involvement, is undoubtedly difficult to achieve using traditional participation. Nowadays, a lot of successful initiatives have been developed, adopting the 'share' term as an imperative. These positive experiences based on mass collaboration

[4] M. C. Gibelli, 'Tre famiglie di piani strategici: verso un modello "reticolare" e "visionario"', in M. C. Gibelli and F. Curti (eds), *Pianificazione strategica e gestione dello sviluppo urbano*, Alinea, Firenze, 1996.

[5] J. M. Bryson and R. C. Einsweiler, 'Strategic planning: introduction', *Journal of the American Planning Association*, 53(1), 1987, pp. 6–8.

[6] J. M. Bryson, *Strategic Planning for Public and Nonprofit Organizations: A Guide to Strengthening and Sustaining Organizational Achievement*, John Wiley, San Francisco, 2004.

[7] J. M. Bryson and R. C. Einsweiler (eds), *Strategic Planning: Threats and Opportunities for Planners*, Planners Press, American Planning Association, Chicago, IL and Washington, DC, 1988.

[8] A. Balducci, 'Pianificazione strategica e politiche di sviluppo locale. Una relazione necessaria?', *Archivio di Studi Urbani e Regionali*, No. 64, 1999.

[9] P. Le Galès, 'Du gouvernment des villes à la gouvernance urbaine', *Revue Francaise de Science Politique*, 45(1), 1995, pp. 57–95.

generated Wikinomics,[10] which, following the advent of Web 2.0, have become Socialnomics,[11] where citizens are voluntary sensors.[12] Why the spontaneous action of citizens cannot be exploited to support programming in a sort of 'People-driven economy'? Why are several donations and free time of software specialists the most serious threat for Microsoft? And why a participatory approach to planning cannot in any way limit the power of real estate cartels in our cities? Why did hundreds of people Twit for months, composing the first social opera 'Twitter Dammerung' staged at the Royal Opera House in London and does no one think to adopt a Web 2.0 approach in spatial decision-making?[13]

These questions were taken into account in Marmo Platano–Melandro Territorial Integrated Projects (PITs). Marmo Platano–Melandro is an area with high potential in the north-western part of Basilicata Region (Italy), including 15 municipalities and two consortiums of communes in mountain areas. PITs are local organizations responsible for the accomplishment of Regional Operational Programs (POR) in Italian Objective 1 regions and for the elaboration of common and shared strategies for local development. Their major objective was the development of synergies and scale economies in a multi-scalar perspective of governance favouring groups of municipalities. Unfortunately, without any doubt, PITs represent a big missed opportunity to apply strategic planning principles, as political and bureaucratic obstacles transformed an instrument with great potential in a simple sum of projects proposed by municipalities without any form of evaluation.[14] Participatory and visioning phases were completely ignored, though the programme spanned for five years, and the analytical phase, in most cases, represented a sort of justification for already decided interventions.

In such a scenario, Marmo Platano–Melandro PIT might definitely be considered as an exception. A methodology of spatialization of programmed interventions has been developed, allowing, through the implementation of WEBSITE (a website providing to the citizens information on these interventions) and WEBGIS (a Geographic Information System on the Web), to increase the level of transparency concerning programming choices in the implementation phase. WEBGIS was coupled with a BLOG (a typical web log) providing interaction capabilities), in order to have feedback from citizens concerning the programmed interventions and taking an active part in defining the next programming phase.[15] In most of the current programming tools,

[10] D. Tapscott and A. D. Williams, *Wikinomics: How Mass Collaboration Changes Everything*, Penguin Group, New York, 2006.

[11] E. Qualman, *Socialnomics: How Social Media Transforms the Way we Live and do Business*, John Wiley, Hoboken, NJ, 2009.

[12] M. F. Goodchild, 'Citizens as sensors: the world of volunteered geography', *GeoJournal*, 69, 2007, pp. 211–221.

[13] C. Rinner, C. Keßler and S. Andrulis, 'The use of Web 2.0 concepts to support deliberation in spatial decision-making', *Computers, Environment and Urban Systems*, 32(5), 2008, pp. 386–395.

[14] F. D. Moccia, 'Resistenze alla pianificazione strategica: un'analisi trans-culturale della ricezione ed uso della pianificazione strategica nella pianificazione integrata italiana', in F. Archibugi and A. Saturnino (eds), *Pianificazione strategica e governabilità ambientale*, Alinea, Firenze, 2004.

[15] L. Tilio, F. Scorza, V. Lanza and B. Murgante, 'Open source resources and Web 2.0 potentialities for a new democratic approach in programming practices', *Lecture Notes in Artificial Intelligence*, Vol. 5736, Springer-Verlag, Berlin, 2009, pp. 228–237.

a bottom-up approach considers municipalities as the lowest level of shared decision, ignoring citizen knowledge, ideas, opinions and imagination, which might improve the quality of planning choices. In order to increase the extent of public participation, the above-mentioned systems, WEBSITE, WEBGIS and BLOG, inform people, promoting transparency in choices, and allow them to freely express their ideas and opinions, thus providing local authorities with the possibility to collect and use valuable knowledge.

The attempt of creating a new governance model, based on cohesion and cooperation among local authorities, is the way towards the improvement of efficacy and effectiveness. In this direction, major objectives of the experience described in this paper are:

(1) creating a common, extended and shared knowledge of territory;
(2) innovating programming procedures using geographical dimensions;
(3) making it possible to assess efficacy and effectiveness in public policies;
(4) increasing citizen participation for the EU programming period 2007–13, considering the lessons learned from 2000 to 2006 EU regional policies.

Programming Documents and Spatial Information

During the past decades, the main problem in GIS implementation was the lack of spatial data. Nowadays, the wide diffusion of electronic devices containing geo-referenced information has resulted in the production of extensive spatial data. This trend has led to 'GIS wikification',[16] where mass collaboration plays a key role in the main components of spatial information (hardware, software, data and people). The need of greater computing power (hardware) has been solved by grid computing; open source software has significantly increased market share. Mass collaboration in many cases represents a threat for a lot of professions and new terms have been coined, such as citizen journalism, citizen science, citizen geography, etc.[17] The term 'neogeography'[18] is often adopted to describe people activities when using and creating their own maps, geo-tagging pictures, movies, websites, etc.[19] It could be defined as a new approach to geography without a geographer.[20] Considering that this activity is mainly developed by enthusiasts, it is possible to reach good levels of accuracy in the same way that Wikipedia has reached quality levels comparable to *Encyclopaedia Britannica*.[21] The volunteered approach has been adopted by important American organizations, such as US Geological Survey, US Census Bureau, etc.

[16] D. S. Sui, 'The wikification of GIS and its consequences: or Angelina Jolie's new tattoo and the future of GIS', *Computers, Environment and Urban Systems*, 32(1), 2008, pp. 1–5.

[17] M. F. Goodchild, 'Citizens as voluntary sensors: spatial data infrastructure in the world of Web 2.0', *International Journal of Spatial Data Infrastructures Research*, 2, 2007, pp. 24–32.

[18] A. Turner, *Introduction to Neogeography*, O'Reilly Media, Sebastopol, CA, 2006.

[19] A. Hudson-Smith, R. Milton, J. Dearden and M. Batty, 'The neogeography of virtual cities: digital mirrors into a recursive world', in M. Foth, *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City*, Information Science Reference, IGI Global, Hershey, PA, 2009.

[20] M. F. Goodchild, 'NeoGeography and the nature of geographic expertise', *Journal of Location Based Services*, 3, 2009, pp. 82–96.

[21] J. Giles, 'Internet encyclopedias go head to head', *Nature*, 438, 2005, pp. 900–901.

Volunteered geographic information activities (e.g. Wikimapia, OpenStreetMap), public initiatives (e.g. Spatial Data Infrastructures, Geo-portals) and private projects (e.g. Google Earth, Microsoft Virtual Earth, etc.) produced an overabundance of spatial data.[22] Whilst technologies (e.g. GPS, remote sensing, etc.) can be useful in producing new spatial data, volunteered activities are the only way to update and describe such data. If, on the one hand, spatial data have been produced in various ways, on the other hand remote sensing, sensor networks and other electronic devices generate a great flow of geographically referenced data concerning diverse aspects of human activities or environmental phenomena monitoring.

Kitsuregawa *et al*.[23] called this era the 'Information-Explosion Era' since it is characterized by a large amount of information produced by human activities and automated systems; the capturing and manipulation of this information is called ubiquitous computing and represents a sort of bridge between computers and the real world, accounting for the social dimension of human environments.[24] If this technological evolution produced a new Paradigm of Urban Development, called u-City[25] in rural areas, like much of the Marmo Platano–Meladro area is, new approaches based on integration of Web 2.0 and spatial information could help local communities in pursuing the objectives of economic growth, considering sustainability and transparency in decision-making. In this scenario it is fundamental to develop a new method of spatialization for programming documents. These documents are not strictly connected to cartographic representations and the geographical description is vague in nature.[26] For this reason an attempt to translate policy statements into their geographical elements has been developed, establishing a method for the spatialization of economic programmes in order to increase efficiency and effectiveness of strategic actions (Figure 1). Another important activity was to implement the entire planning system in a GIS environment, governing the whole territory of the study area.

Local authorities are regulated by a huge number of plans developed over time, for a variety of purposes and at different scales. In most recent cases, local plans do not take into account sector-based plans, sometimes developing conflicting objectives. The use of GIS allows a synchronized interpretation of the planning system evaluating the conflicts with programming documents.

The spatialization of policy documents can be intended as a relevant contribution to the improvement of rationality in planning processes. In planning

[22] B. Murgante, G. Borruso and A. Lapucci, 'Geocomputation and urban planning', in B. Murgante, G. Borruso and A. Lapucci (eds), *Geocomputation and Urban Planning Studies in Computational Intelligence*, Vol. 176, Springer-Verlag, Berlin, 2009, pp. 1–18.

[23] M. Kitsuregawa, S. Matsuoka, T. Matsuyama, O. Sudoh and J. Adachi, 'Cyber infrastructure for the information-explosion era', *Journal of Japanese Society for Artificial Intelligence*, 22(2), 2007, pp. 209–214.

[24] A. Greenfeld and M. Shepard, *Urban Computing and Its Discontents*, The Architectural League of New York, 2007.

[25] J. S. Hwang, 'u-City: the next paradigm of urban development', in M. Foth, *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City*, Information Science Reference, IGI Global, Hershey, PA, 2009.

[26] H. Ottens, 'An information model for strategic spatial policy documents', *Proceedings of the Seventh Agile International Conference on Geographical Information Science*, Heraklion, 2004.

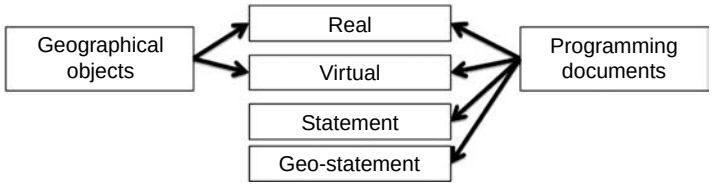

Figure 1. Programming documents and geographical information.

theory, there is a general agreement in these seven requirements for the rationality of strategic planning:[27]

(1) a better knowledge coherent with management objectives;
(2) a better knowledge of resources in order to choose more appropriate and effective means for achieving objectives;
(3) a better knowledge of the complete effects and impacts of decisions;
(4) a better knowledge of the compatibility of decisions with other decisions by the same decisional subject;
(5) a better knowledge of the compatibility of decisions with other decisions by subjects which operate in the same field;
(6) a better knowledge of costs and direct results involved in subject decisions;
(7) a better ability to estimate relationships between costs and results (agreed as effects in comparison with objectives).

The term 'knowledge' appears almost in all these seven statements. The possibility to analyse strategic documents also according to geographical components must be considered as a huge increase of knowledge. For instance, the third statement may allow a better external effect evaluation in spatial terms. Points 4 and 5 highlight coherence, compatibility, redundancy and duplication. Some assessment ambiguities might occur in analysing strategic documents only considering the agency or organization promoting them. Spatial aspects may allow us to recognize in advance redundancies generated by geographical proximity of some programmes developed from different local authorities.

In this project, we did not limit our analysis to the socio-economic framework. We worked to identify the exact location of interventions produced on the context by programmes and plans. Inspections and interviews with local managers have been carried out in order to define a local intervention framework. A preliminary study of programming documents has been carried out with the aim of achieving an effective synthesis of major contents, trying to homogenize information which is different in each document and at a different scale.

On the one hand, this activity has allowed us to carry out a first evaluation concerning the degree of coherence between actions and vocations, potentialities and specific expectations of the territorial context; on the other hand, it has allowed us to verify the coherence between choices of socio-economic programming. Representation of interventions by means of geometric primitives has been addressed in the following way (Figure 2):

[27] F. Archibugi, *Introduction to Strategic Planning in the Public Domain*, Planning Studies Centre, Rome, 2002.

(1) *localized and georeferenced interventions*: geographical data have been located on the intervention object, or on the whole of the indications of infrastructures for mobility routes;
(2) *localized and not georeferenced interventions*: geographical data have been located on specific territorial boundaries (e.g. downtowns, industrial areas, census zones), or, in the case of linear data with unknown path intervention, they can be represented by a simple line connecting the interested zones;
(3) *neither localized nor georeferenced interventions*: geographical data do not fit this kind of intervention because they are intrinsically not localized (education programmes), or, in some cases, can be referred to administrative boundaries (e.g. Regions, Provinces, Municipalities).

Spatialization concerns several informative layers, mostly related to economic programming, more particularly POR interventions, infrastructural interventions funded by PIT and State aids during the same programming period, but also some other services and elements, linked to the rural system, as farms, tourist services, handmade productions, etc. As mentioned above, one of the weaknesses of programming documents is vagueness of geographical location. Difficulties in the localization phase are mainly related to the great amount of elements to locate and to the lack of related information. Two approaches have been pursued: many activities have been located on maps using the local knowledge of municipality staff who were able to identify precise intervention positions; the remaining interventions have been identified by means of Google Earth. This approach could increase the transparency of choices, in the programming phase evaluation, assessing interventions in their context, analysing spatial location and obtaining a measure of *ex ante* coherence and *ex post* efficacy of the context. The spatialization procedure may increase the level of efficacy and efficiency, because it is possible to compare programming to planning documents, constraint systems and territorial features in a very detailed way.

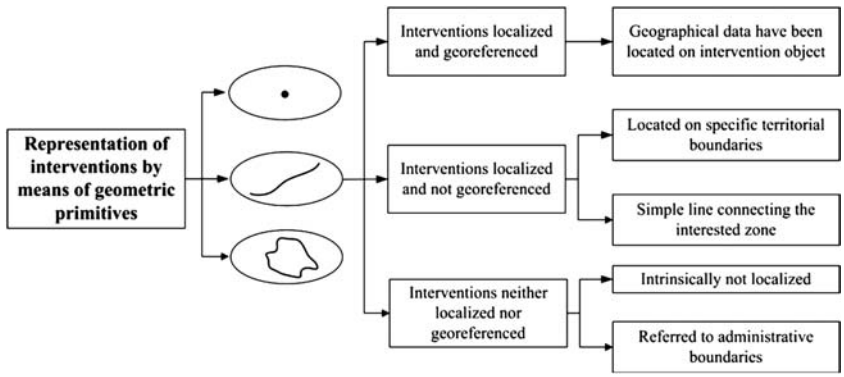

Figure 2. Spatialization of programming documents scheme.

An E-approach for Programming Activities: Web 2.0 Tools for PIT

In recent years, the Internet has become a popular medium for carrying out all kinds of commercial, social and governmental activities. Presumably it has become a part of society quicker than any other new technology and it is now considered as a new democratizing tool, supposedly bringing people closer together and allowing them to participate in social and political activity.[28] During the last decade, all governments and local organizations have been using the Internet and ICT e-government tools more and more in order to give more opportunities for citizen participation and therefore for enhancing information and service delivery to citizens. It is necessary to consider that citizen participation needs constant communication, using new tools in order to facilitate a bottom-up participation process.[29] It is also important that, especially at this time and in this society, citizens perceive that their actions could be appreciated and partially or totally accepted by local authorities. This approach offers the advantage of stimulating citizen involvement in the choice of design alternatives in programming processes, overcoming time and space constraints.

According to a study led by Evans-Cowley and Conroy examining municipal planning-related US websites, we can distinguish between two types of electronic tools: information tools, representing a low participation level and providing a 'one-way' participation, and interaction tools, providing a 'two-way' participation, including citizens' opinions, considering them as process actors through a mutual exchange of comments, questions, discussion channels, etc.[30]

Taking these into account in Marmo Platano–Melandro a typical information provision tool, named WEBSITE, was developed, which contains news, information from press reviews, events, publications, invitations and notices, documents and sections aiming to explain PIT objectives, principles and implementation status, institutional activities, projects, photos and videos. Unfortunately, at present, WEBSITE (www.pitmpm.it) is not available, due to changes in local administration.

Although it is a very popular communication tool among governments and institutions, and despite the fact that the Marmo Platano–Melandro PIT WEBSITE is very complete in content and information, it represents a low participation level. In order to achieve a higher participation level, an interaction tool, the WEBGIS, has been activated to generate a distributed and collaborative environment.[31] It can be defined as an 'interactive information tool', since on the one hand it gives geographic information and allows every stakeholder to be informed about the territory. On the other hand, indeed, the user has to decide what kind of information he/she wants to receive, what reference scale and

[28] S. Woolgar (ed.), *Virtual Society?—Technology, Cyberbole, Reality*, Oxford University Press, Oxford, 2002.

[29] S. Knapp and V. Coors, 'The use of eParticipation systems in public participation: the VEPs example', in V. Coors *et al.* (eds), *Urban and Regional Data Management*, Taylor and Francis, London, 2008, pp. 93–104.

[30] J. Evans-Cowley and M. M. Conroy, 'The growth of e-government in municipal planning', *Journal of Urban Technology*, 13(1), 2006, pp. 81–107.

[31] S. Boroushaki and J. Malczewski, 'ParcitipatoryGIS.com: a WebGIS-based collaborative multicriteria decision analysis', *Journal of the Urban and Regional Information Systems Association*, 22(1), 2010, pp. 23–32.

detail level he/she wants to reach; so there is a sort of interaction with the WEBGIS.

However, WEBSITE and WEBGIS are not enough for public participation as the information flow goes only from PIT to citizens. It is important to create a kind of virtual space where people can discuss, compare and exchange information, suggesting ideas to public administrations. The support of Web 2.0 (the new emerging model of the Internet, based on extensive content generation by users and collaboration) and ICT technologies aims to capitalize collective intelligence in programming processes. Interesting aspects are related, on the one hand, to the creation of a real local organization network, in order to promote transparency, participation to choices, equity, redistribution principles and, on the other hand, to the application of ICT new tools to promote citizen participation in community activities.

Theories about communicative planning have emphasized forcefully how language and modes of communication play a key role in shaping planning practices, public dialogues, policy-making and collaboration processes,[32] and today the most popular and effective tool for exchanging opinions and collecting information is the web log (blog). So, it has been decided to use a BLOG as an interaction tool, since other tools (e.g. e-mail addresses) on the one hand definitely give citizens a different way to communicate their ideas, questions and concerns, and on the other hand do not allow the planner or any management planning or programming process to assure transparency and sharing. Later on, specific attention is dedicated to two of the electronic tools used: WEBGIS and BLOG.

In order to promote a spread of spatial data knowledge, allow consultation of planning and programming documents, involve different stakeholders' participation and increase the transparency level of programming choices via the Internet, this research project led to two main concrete results, a WEBGIS and a Web Map Service.[33]

According to the opinion of the administration, the above-mentioned objectives are considered strategic to achieving its key objectives of promoting local development and adopting new governance models. Spatial data knowledge contributes to improve rationality in planning processes, so that acquisition and production of spatial information have been important phases of research; but once data have been collected and produced, the next important issue is how to make information available for citizens and stakeholders. The Internet, and especially web-based GIS systems, can be the means to promote open accessibility and effective distribution of spatial information.[34]

Also considering that several administrations act on the Marmo Platano–Melandro area and that they use spatial information (moreover, they contribute to data acquisition and production), it seemed interesting to adopt the INSPIRE directive and work to realize a spatial data infrastructure. Due to scarcity of resources and a low GIS culture, the attempt was really hard, so that at the

[32] J. Pløger, 'Public participation and the art of governance', *Environment and Planning B: Planning and Design*, 28, 2001, pp. 219–241.

[33] Available respectively at: <www.pitmpm.basilicata.it/PIT/map.phtml> and <www.pitmpm.basilicata.it/cgi-bin/wms_pit>

[34] Boroushaki and Malczewski, op. cit.

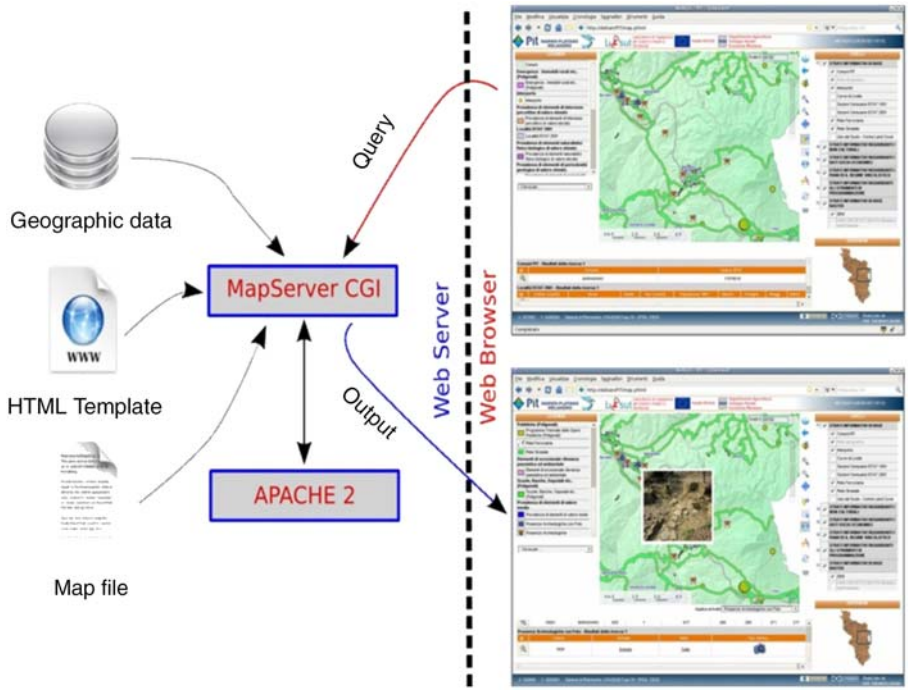

Figure 3. Marmo Platano–Melandro PIT WEBGIS architecture.

moment PIT has not yet completed its own Spatial Data Infrastructure, but it is working towards it. At present, as mentioned above, two concrete tools have been implemented, which are useful for objective fulfilment: WEBGIS and WMS.

WEBGIS, implemented on an open-source platform, is based on a client-server architecture which accesses rules via Internet or intranet in order to navigate, update and maintain data; its architecture is shown in Figure 3. The adopted operating system is Debian GNU/Linux, and the most common applications of Geospatial Free and Open Source Software (GFOSS) have been used. Open GIS Consortium specifications have been adopted, in order to ensure interchange and interoperability standards for WEBGIS systems, and each informative layer is provided with metadata, edited according to ISO 19115 standard and following Metadata National Repertory (CNIPA). WEBGIS has been created so that three kinds of users can login, in order to participate in consultations: citizens and non-expert users, local administration and finally PIT administrators.

Concerning content, it is possible to divide it into four groups of informative layers:

(1) Basic Data Layers: this group includes data layers concerning territorial structures: administrative limits, road and railway network, hydrography, etc.;
(2) Socio-Economical Data Layers: in this group information concerning population and employment characteristics of the area is included;
(3) Planning System and Constraint System Data Layers: urban plans and sector-based plans, after homogenization, are included in this group;

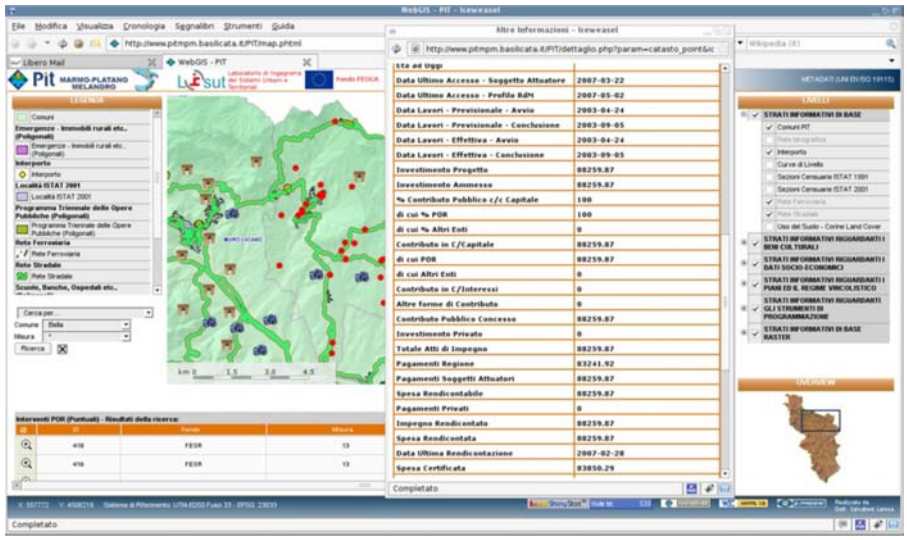

Figure 4. Marmo Platano–Melandro PIT WEBGIS (http://www.pitmpm.basilicata.it/PIT/map.phtml).

(4) Economic Programming Data Layers: this group includes information on programming documents concerning POR Basilicata 2000–2006, socio-economic plan of consortium of communes in mountain areas and other economic programming documents. These data have been produced, introducing an important innovation concerning spatialization of economic documents, that typically miss the spatial dimension as mentioned above.

Concerning available tools, WEBGIS allows citizens, practitioners and employees to navigate choosing/selecting in a very simple way (its interface is completely user-friendly), visualizing spatial data, zooming on a specific area and also interrogating the system. This capability to submit queries in this context represents a great contribution to increasing transparency of practices and procedures. In fact, it is possible to obtain information concerning interventions of economic programmes, in terms of expenditure. Citizens, surfing in WEBGIS, can become aware that in their municipality a certain amount of public funds have been spent in local development interventions. The screenshot of Figure 4 shows an example of such a query, with results in a pop-up.

According to the OGC standard, in order to improve the spread of spatial data information, a Web Map Service (WMS) has been implemented, that is a standard and free service through which it is possible dynamically to reproduce maps, visualized as JPEG, GIF or PNG in any GIS software. Users, adding a URL, could overlap other data to their own data. The Web Map Service is available at the URL www.pitmpm.basilicata.it/cgi-bin/wms_pit.

In Macpherson's study[35] different kinds of such tools were listed among interaction tools. Interaction tools include e-mail addresses for e-mailing questions, online registration for news and other information, online application

[35] L. Macpherson, 'Joystick not included: new media technologies are ideal tools for gaining stakeholder interest, acceptance', *Water Environment and Technology*, 11(9), 1999, pp. 51–53.

Figure 5. Marmo Platano–Melandro PIT BLOG (http://BLOGpit.wordpress.com).

submissions and online planning discussion forums. In our case a set of e-tools has been developed, considering different kinds of communication possible via the Internet, in the firm belief that the great potential of the Internet allows citizens to 'visualize issues and concepts, participate in dialogue, and gain knowledge by interacting'. The most suitable interaction tool for this experience is the blog. The BLOG[36] (Figure 5) designed for the Marmo Platano–Melandro PIT derives from the need to ensure citizens' information and interaction with the institutions on government policies.

BLOG purposes can be summarized in the following points:

(1) active participation of users through comments;
(2) collection of all instances concerning past and future programming policies;
(3) dialogue between organizations and data users;
(4) collaboration relationship and constant involvement of citizens in public decisions;
(5) transparency and accessibility to decision-making processes;
(6) transparency in intervention programming.

The BLOG represents a resource for local development, community life and identity; it promotes collaborative relationships and constant citizen involvement in public decisions, overcoming typical participation constraints and giving more emphasis to the role of citizens. At present, we cannot give any interesting result concerning the use of the BLOG because it has been available only for a short time. At present it is not available, due to changes in local administration, but we

[36] Available at: <http://blogpit.wordpress.com>.

hope that it will again be online from September 2010, in order to guarantee a real citizenship involvement into the 2007–13 programming period.

Interoperability in E-government Process: New Issues in Organizing and Sharing Knowledge

This complex framework of e-tools for bottom-up public participation processes, concerning programming and management of local development, poses several issues related to common problems of participation processes, which are primarily connected to the procedural structure considered at the base of EU Regional Policies and Funds. Do stakeholders understand the meaning of general and sectoral policies? Are citizens aware of technical instruments implementing such policies? Are they conscious of *ex ante* comprehensive context analysis and/or can they share possible future scenarios? The system of knowledge connected to planning tools is mainly interdisciplinary and involves a lot of technical interventions. Each technical field of knowledge implies different languages, different regulations, different axioms, etc. Thus the planner has to manage a multidisciplinary complexity with the heavy task of communication and interaction with the decisional levels (mainly the political one) and with the hierarchy of participatory levels defined by laws and by the new practices of bottom-up planning. This complex system of interactions could effectively work under the assumption of a distributed and shared knowledge among the actors participating in the process. In practice it is possible to demonstrate how difficult it is to realize such a condition. On the basis of these considerations it is possible to identify two methodological hypotheses: (i) citizens (or actors) involved in the process hold the complete technical/scientific knowledge of disciplines concerning the planning process; (ii) there is a strong direction (the 'planning office' or similar structure involving the planner) entitled to manage the process. Among others, a task to be accomplished is to interpret 'common' requests, often points of view, expressed by those citizens as technical views.

The second hypothesis implies a process of reinterpretation and translation with the risk of personal interpretation of the issues promoted by participants. It could affect the bottom-up approach and the whole rationality of the planning process. Generally speaking, the first hypothesis could be defined as an absurd condition even if it fully guarantees the bottom-up approach in a framework of wide participation of actors, stakeholders and beneficiaries. But if we design a bounded participation for the planning process we could consider the first hypothesis as verified. We intend that the participant community should be restricted to a number of representative bodies with technical competences able to manage and interact with the planner and the decisional level of the process.

It is possible to identify the following critical factors: (i) open participation processes must be managed by effective groups of experts (previously defined as 'strong direction') but this could cause a problem of personal interpretation of instances produced by the bottom-up process; (ii) restricted participation should ensure representativeness of involved actors in order to get relevant results in the planning process; (iii) an over-tasked 'strong direction' (responsible for the technical development of the plan and for the participation management) could be ineffective without concrete opportunities to produce the expected results.

The key problem in enlarging participation appears to be related to a difficulty of communication between involved actors in accordance with the general assumption by Uschold and Gruninger: 'people organizations and software systems must communicate among themselves. [. . .] there can be widely varying viewpoints and assumptions regarding the same subject matter.'[37] In this 'lacking shared understanding' framework, the level of communication decreases and consequently, interaction between actors becomes ineffective even if supported by e-tools. In defining a programme, this misunderstanding participation could cause difficulties concerning the identification of objectives and priorities with subsequent problems related to the decisional level. The comparison with interoperability in spatial data infrastructures (referring to Pundt,[38] Mark *et al.*,[39] Lemmens *et al.*[40] and Fonseca[41]) should be considered as well.

Starting from the definition by Laurini and Murgante,[42] we might affirm that, in our context interoperability is the 'technical incapacity for different systems, actors or stakeholders to work together without conflicts in procedures or contents'. According to this definition, 'systems' include normative tools, regulations, laws, other plans or programmes overseeing the planning process.

Therefore, new problems coming from the implementation of e-tools in programming local development are closely connected to the level of sharing knowledge in technical understanding (including interdisciplinary, normative and procedural issues) and in contents. One way to tackle such problems is the use of ontologies. Overcoming the traditional philosophical definition of ontology as the 'discipline dealing with theories of being', we will use a slightly different notion of a specific ontology *as a model* which can be defined as '*the explicit specification of an abstract, simplified view of a world we desire to represent*' (proposed, among others, by Gruber[43]).

Structural elements of the ontology are: domain (or 'scope' of the ontology), concepts ('classes'), hierarchies, attributes of concepts, restrictions and relations between concepts, instances. The definition of such elements represents the 'ontology design'.[44] The domain is the abstraction of the reality we want to represent and, in the study case, it is composed of physical elements, relations between them, value systems, programme actions, social issues and policy goals. The ontological representation aims to obtain a greater efficacy in the

[37] M. Uschold and M. Gruninger, 'Ontologies: principles, methods and applications', *Knowledge Engineering Review*, 11, 1996, pp. 36–116.

[38] H. Pundt, 'Domain ontologies for data sharing—an example from environmental monitoring using field GIS', *Computers & Geosciences*, 28(1), 2002, pp. 95–102, doi:10.1016/S0098-3004(01)00018-8.

[39] D. M. Mark, B. Smith and B. Tversky, 'Ontology and geographic objects: an empirical study of cognitive categorization', *Cognitive Science*, 1997.

[40] R. Lemmens, M. de Vries and T. Aditya, 'Semantic extension of GEO WEB service descriptions with ontology languages', *Proceedings of the 6th AGILE*, Vol. 1, Lyon, 2003.

[41] F. Fonseca, 'Ontologies and knowledge sharing in urban GIS', *Computers, Environment and Urban Systems*, 24(3), 2000, pp. 251–272, doi:10.1016/S0198-9715(00)00004-1.

[42] R. Laurini and B. Murgante, 'Interoperabilità semantica e geometrica nelle basi di dati geografiche nella pianificazione urbana', in B. Murgante (ed.), *L'informazione geografica a supporto della pianificazione territoriale*, Franco Angeli, Milano, 2008, pp. 229–244.

[43] T. R. Gruber, 'Toward principles for the design of ontologies used for knowledge sharing', *International Journal of Human and Computer Studies*, 43(5/6), 1995, pp. 907–928.

[44] P. Ceravolo and E. Damiani, 'Introduction to ontology engineering', in A. Zilli *et al.* (eds), *Semantic Knowledge Management: An Ontology-Based Framework*, Information Science Reference, IGI Global, Hershey, PA, 2008, ISBN 978-1-60566-034-9.

participation process overcoming the traditional collection of 'people's points of view' in order to gain a real bottom-up process in programming local development.

Ontology may have different formalizations and must necessarily include a thesaurus of terms (concept names) and associated definitions (axioms), and (at least) taxonomic relationships. In an ontological system, a 'concept' is an accurate representation of an entity belonging to the reality. Entities can be 'real' or 'abstract'. Concepts can be linked by taxonomic relations and non-taxonomic relations and may be defined by axioms expressible in natural language, logical or procedural formalization.

Among others, Garro and Ruffolo[45] precise that taxonomic relations, through which one can build hierarchies and/or taxonomies of concepts, are expressed through the following two constructs:

(1) specialization and/or generalization (IS_A);
(2) part-of and/or compound-of (PART_OF, HAS_PART).

An example of non-taxonomic relation between concepts is the 'similarity', which specifies the degree of similarity between different concepts through a similarity coefficient.

Axiomatic relations, in other words the assumptions on the concepts and their relations, are expressible through:

(1) strong constraints, which specify absolutely necessary conditions for a concept in order to express a certain property;
(2) weak constraints, which specify the conditions that would be preferable to occur so that a given concept could express a certain property.

Intrinsic properties of ontological entities are specified through the following two types of properties or attributes:

(1) unstructured properties or attributes specifying characteristics expressed through natural language;
(2) structured properties or attributes specifying a characteristic expressed in a precise representation formalism (for instance, a portion of the diagram entities/relations).

Different examples of ontologies are accessible in several scientific areas. Loukis[46] analysed several examples of existing ontologies in the field of public policy-making. Among the existing sectoral ontologies (e.g. for the environment, cultural heritage, government, etc.) problems of interaction among actors involved in the process are not fully addressed. In fact, several ontologies are mainly glossaries of terms regarding a specific knowledge sector. Other examples concern very specific applications with limited opportunities to be transferred in other contexts. In the field of planning, a relevant example is PLANET

[45] A. Garro and M. Ruffolo, 'Gestire la Conoscenza in Domini Complessi: Rappresentazione e Gestione di Ontologie attraverso Mappe della Conoscenza (Knowledge Map)', Rapporto Tecnico ICAR/CS/2003/03, ICAR-CNR—Istituto di Calcolo e Reti ad Alte Prestazioni del Consiglio Nazionale delle Ricerche, 2003.

[46] E. Loukis, 'An ontology for G2G collaboration in public policy making, implementation and evaluation', *Artificial Intelligence and Law*, 15(1), 2007, pp. 19–48.

Ontology,[47] but for our research purposes no sources were available. In fact, the case of PLANET application concerns the representation of territorial and urban plans without integration with the level of programming economic resources for local development, too. Therefore, a process of ontology building has been developed following instances that emerged from e-tools design and implementation. Results belong to the class of 'Domain ontologies' as described in the classification proposed by Visser and Bench-Capon.[48]

In this case we structured our ontology including the following super-classes:

(1) Plan, defined as 'Written account of intended future course of action (scheme), aiming at achieving specific goal(s) or objective(s) within a specific timeframe. It explains in a detailed way what, when, how, and by whom the work needs to be done and often it includes best case, expected case, and worst case scenarios.'[49]
(2) Project, defined as 'Planned set of interrelated tasks to be executed over a fixed period and within certain costs and other limitations.'[50]
(3) Policy, defined as 'A specific statement of principle or of guiding actions that implies clear commitment but is not mandatory. A general direction that a governmental agency sets to follow, in order to meet its goals and objectives before undertaking an action program.'[51]
(4) Tools, defined as 'Financial or normative instruments for policy implementation' (our definition).
(5) Actors, defined as 'Groups of private, public, no-profit bodies involved in development process' (our definition).

Figure 6 represents the super-classes structure of our ontology with the main relations among them.

In order to be useful, the ontology has to be shared. In an international community of users, the first difficulty comes from languages, but a similar problem emerges when we match together different programmes or plans adopted by different bodies. Ontologies can help the community to define and make explicit a common language and strengthen the efficacy of direct interactions.

The development of an ontology might be quite different depending on the level of users' involvement. In the present case, the ontological approach has been developed by a limited group of experts (managing the research project, coming from different scientific disciplines). The result is an ontology that will be 'imposed' on the community members through the above-mentioned e-tools (WEBSITE, WEBGIS, BLOG). Following an agreed building process among

[47] Y. Gil and J. Blythe, 'PLANET: a shareable and reusable ontology for representing plans', in *AAAI Workshop on Representational Issues for Real-World Planning Systems*, 2000, available at: <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:PLANET:+A+Shareable+and+Reusable+Ontology+for+Representing+Plans#0> (accessed February 2011).

[48] P. R. S. Visser and T. J. M. Bench-Capon, 'On the reusability of ontologies in knowledge systems design', in *The Proceedings of the Seventh International Workshop on Database and Expert Systems Applications—DEXA '96*, Zurich, Switzerland, 1996, pp. 256–261.

[49] Business Dictionary, available at: <http://www.businessdictionary.com/>.

[50] Business Dictionary, available at: <http://www.businessdictionary.com/>.

[51] N. H. Knox, with the contribution of L. Mintier, 'The California general plan glossary', in C. H. Knox and N. H. Knox (eds), *California Planning Roundtable*, June 2003, available at: <http://www.cproundtable.org/publications/california-general-plan-glossary/> (accessed February 2011).

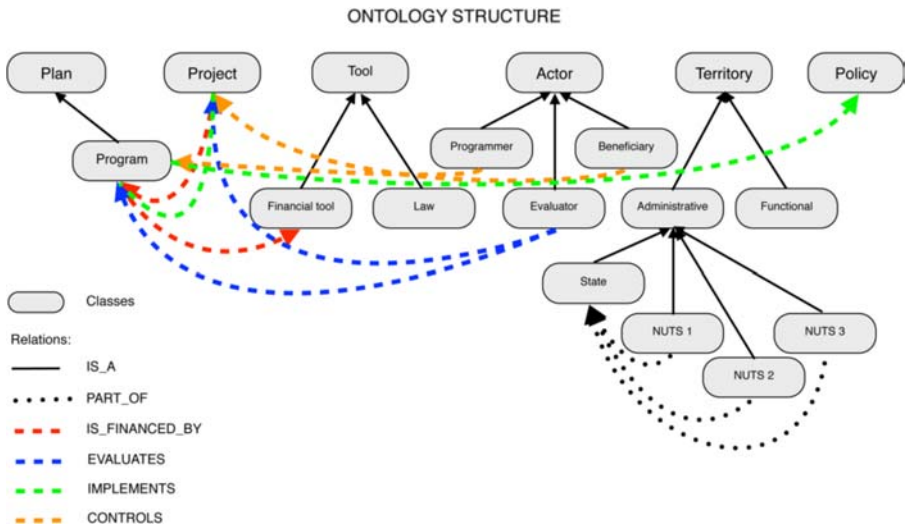

Figure 6. Ontology structure.

experts, a kind of negotiation process of class identification and axiom selection, we developed a thesaurus of 183 terms and, at the end of the process, we obtained a complex network of classes and relations including: 124 classes, 148 axioms and 11 independent relations. This is still considered an ongoing tool because of the nature of the domain of the application, but it is ready to be adopted in the framework of the new EU programming period 2007–13.

Conclusions

In the framework of reticular strategic governance processes, the adoption of an e-tools system supporting public participation represents an innovative experience, considering both the domain of the application and the methodological structure. However, enhancement of bottom-up processes based on public participation remains an exception in current practices, since the counterfactual case[52] is still an improbable assessment and too many resources are devoted to manage administrative procedures rather than to develop effective planning. The methodology we adopted in the case described in this paper merged together freeware ICT platforms and spatial data infrastructures in a brand new integrated system, aiming to improve the level of participation. Consequently the experience analysed in this research may be attributed to the 1990s visionary approach to strategic planning.

Generally, in an electronic environment, it is possible to establish a democratic place where everyone can freely express themselves. Moreover, electronic participation exceeds the typical limitations of traditional participation, as synchronous and location-based,[53] and it encourages individuals, who are in

[52] P. Bishop, T. Hart, P. Gripaios and E. McVittie, 'Analysing the impact of Objective 1 funding in Europe: a review', *Environmental and Planning C: Government and Policy*, 26, 2008, pp. 499–524.

[53] Boroushaki and Malczewski, op. cit.

general reluctant,[54] to express their preferences. In this way, the use of ICT represents a fruitful strategy for bottom-up programming processes. Nevertheless, if ICT tools improve and support the participation process, it is relevant to underline the importance of developing such a process based on a widely shared knowledge framework through the adoption of a domain ontology.

WEBSITE, WEBGIS and BLOG seem to be attractive tools to promote participatory practices among citizens, because they are becoming more and more familiar to them. Having 'familiar' tools might greatly increase potential 'participation'.[55] Through this integrated e-government system, we might obtain a transition from face-oriented or file-oriented governance services to a comprehensive digital one. This might result in increased effectiveness, improved public information diffusion and enhanced participation opportunities for citizens.[56] Innovative experiences of participation in planning development (established by local authorities) are still relatively rare. It is possible to affirm that our approach could provide effective means through which planners can fully engage with the communities they serve through a more informed planning process.[57]

In the so-called 'consensus logic', the PIT project aimed to build a way of informing and making stakeholders involved in programming processes. The perspective of this first achievement was to help citizens understand, interact and work with the programmers in reaching 'optimal' solutions. This scenario is useful if we consider the EU programming period 2007–13.

As mentioned before, in Italy during recent years few initiatives for citizen involvement in decisional processes have been taken and only a small part of them are described in the literature. In fact, participation processes are mainly applied in urban renewal and urban design experiences. Therefore, the Marmo Platano–Melandro PIT experience, considered as a little experiment, should be taken into account for its relevant and innovative participation aspect connected to local development programming. So it is useful to summarize the major achievements of this experience:

(1) the definition of an e-democratic approach oriented to improve participation in governance processes;
(2) the development of a complex integrated system of e-tools supporting participation management.

The enhancement of the assessment function in programming and managing EU resources could be an additional result of the process. Participants could express ongoing and final evaluations, as components of a comprehensive and

[54] P. Jankowski, 'Towards participatory geographical information systems for community-based environmental decision making', *Journal of Environmental Management*, 90, 2009, pp. 1966–1971.

[55] V. Lanza and D. Prosperi, 'Collaborative e-governance: describing and pre-calibrating the digital milieu', *Urban and Regional Data Management*, Taylor and Francis, London, 2009.

[56] M. M. Conroy and J. Evans-Cowley, 'E-participation in planning: an analysis of cities adopting on-line citizen participation tools', *Environment and Planning C: Government and Policy*, 24, 2006, pp. 371–384.

[57] M. Tewdwr-Jones and H. Thomas, 'Collaborative action in local plan-making: planners' perceptions of "planning through debate"', *Environment and Planning B: Planning and Design*, 25, 1998, pp. 127–144.

context-based evaluation approach,[58] since they hold the basic and necessary knowledge and they are aware of the objectives of the programme, so that they can recognize its direct and indirect impacts on the context.

Beniamino Murgante is Assistant Professor of Urban and Regional Planning at the University of Basilicata (Southern Italy). His main research interests are urban and regional planning with a focus on the use of spatial information for developing decision support systems based on multi-criteria evaluation, fuzzy sets, rough sets and geo-statistical methods.

Address for correspondence: LISUT, DAPIT, Facoltà di Ingegneria, Campus di Macchia Romana, Viale dell'Ateneo Lucano, 10, 85100 Potenza, Italy. E-mail: beniamino.murgante@unibas.it

Lucia Tilio is a PhD student in Sciences and Methods for European Cities and Territories in the Laboratory of Engineering of Urban and Territorial System at the University of Basilicata. Her main research topics are public decision processes and decision support systems.

Address for correspondence: Laboratory of Engineering of Urban and Territorial system, University of Basilicata, Via dell' Ateneo Lucano 10, Potenza 85100, Italy. E-mail: lucia.tilio@unibas.it

Viviana Lanza is Postdoctoral Researcher at the University of Basilicata. She is interested in communicative and participative aspects of urban planning, and in particular in electronic participation in the planning process. She has also conducted research at the Florida Atlantic University, collaborating with Professor David Prosperi.

Address for correspondence: Laboratory of Engineering of Urban and Territorial system, University of Basilicata, Via dell' Ateneo Lucano 10, Potenza 85100, Italy. E-mail: viviana.lanza@unibas.it

Francesco Scorza is a PhD student in Sciences and Methods for European Cities and Territories in the Laboratory of Engineering of Urban and Territorial System at the University of Basilicata. His main research topics are strategic planning and evaluation.

Address for correspondence: Laboratory of Engineering of Urban and Territorial system, University of Basilicata, Via dell' Ateneo Lucano 10, Potenza 85100, Italy. E-mail: francesco.scorza@unibas.it

[58] G. Las Casas and F. Scorza, 'Comprehensive evaluation and context based approach for the future of Regional Operative Programming in Europe', *Proceedings of 48th European Regional Science Association Congress 2008*, Liverpool, 2008.