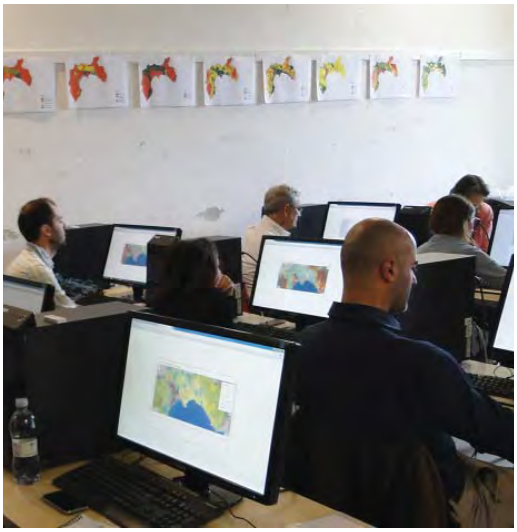

TOWARDS A NOVEL APPROACH TO GEODESIGN ANALYTICS

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ABSTRACT

The adoption of sustainability principles in current European regulatory framework which affect spatial planning and environmental protection, such as Directive 2001/42/C, introduced the need for collaboration and participation in spatial planning practices aiming at achieving more evidence-based, transparent and democratic decision making. However, the involvement of a wide range of actors, along with traditional collaborative and participatory methods, makes it often difficult to grasp the dynamics which drive the process towards the final decision. Emerging design methodologies and increased recourse to advanced information technologies promise unprecedented opportunities not only for applying a system approach and coordinating involved actors, but also for tracking the evolution of the design alternatives toward the final plan. In this context, this paper explores the potential offered by the collaborative Planning Support System Geodesignhub to ease and record the process workflow of geodesign studies. The paper describes underlying theories, research questions formulation and the first results of the analysis of empirical data on the Cagliari Geodesign case study. The set of variables and relations identified in this research endeavor represents the first effort towards the development of an operation framework for geodesign process analysis, which may potentially contribute to clarify the relationships between the knowledge base and the actors in the planning process. The aim is to earning a deeper understanding of the process dynamics for more informed, transparent, and democratic planning, design and decision-making.

KEYWORDS

Geodesign; Process Analytics; Planning Support Systems; Spatial Planning and Design; Collaborative Decision Process

1 INTRODUCTION

Since the early 1990s, the global debate on sustainable development has highlighted the importance of strengthening the decision-making process to ensure, on the one hand, the progressive integration of environmental concerns in spatial planning at different scales, and on the other hand, a wider public participation in the process (UN-WCED, 1987; UNGA, 1992a). The full implementation of Agenda 21 and the commitment to the Rio Declaration principles (UNGA, 1992b) were strongly reaffirmed at the United Nations Summit 2015 by adopting the resolution "Transforming our world: the 2030 Agenda for Sustainable Development" (UNGA, 2015). The core of the outcome document consists of 17 goals that are intended to guide global efforts towards a sustainable future over the next decade. Goals 11 and 16, in particular, acknowledge the need for participatory and integrate human settlement planning, and for responsive and inclusive decision-making at all administrative level. In terms of policy instruments, in Europe the Directive on Strategic Environmental Assessment (SEA - 2001/42/EC) provided renewed impetus for Member States to incorporate environmental considerations into plans and programs, while ensuring transparent and participatory decision-making processes. SEA procedure can, therefore, contribute to an informed and democratic environmental governance facilitating more sustainable forms of development. Despite difficulties on translating guidances into practice, public participation is acknowledged as a defining feature of SEA processes and as an essential element to achieve 2030's sustainability objectives. Operationally, typical spatial planning situations featuring public participation may involve a variable number of actors in many different type of evaluation and decision phases, and have a mix of unstructured and structured activities. The approaches to handling these key aspects had varied over time with the evolution of different planning theories and approaches (Khakee, 1998, 1999) affecting the overall planning process, in particular the definition of a set of design objectives, the construction of the territorial knowledge and how it influences the creation of design alternatives. Among the eight paradigms or theoretical models synthesized by Khakee (1998), in the rational-comprehensive planning, for example, the decision-making process should be well defined in all its phases, the objectives should be chosen at the political level and the planners should formulate alternative proposals according to an expert approach. Conversely, according to the most recent paradigm of communicative planning, technicians no longer develop models applying purely the scientific method, but their role is also to highlights priorities and requirements of the various social groups involved. In the advocacy, transactive and communicative planning, the local community in its various social components participates, albeit with different levels of "social interaction" (Arnstein, 1969; Forester, 1999; Friedmann, 1993), to the more or less structured phases of the process. Nevertheless, despite recognizing the growing importance of participation in spatial planning, citizens involvement in current SEA practice is still relatively poor and with limited influence on actual decision-making (Chaker et al., 2006; Gauthier et al., 2011; Rega & Baldizzone, 2015). Even in those cases where effective public engagement takes place, there is a lack of information and documentation with respect to timing, means and methods. More generally, several authors have highlighted a series of issues in the application of the SEA procedures in the Member States of the European Union, both at the local and the regional level (Arcidiacono, 2012; COWI, 2009; Fischer, 2010; Parker, 2007). Specifically, the objectives of transparency most often cannot be sufficiently achieved: it is often difficult to identify the responsibilities within the decision-making processes for what generate negative impacts on the affected communities; the desired relationship between the identification of environmental issues and the development of design alternatives is not always straightforward. The process for moving expert and experiential knowledge to action in spatial planning is complex and often

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characterized by informal, undefined and/or not well documented activities. Hence the dynamics of the stakeholders' participation and of the entire design process are often poorly understood, limiting greatly transparency and responsibility. Since the inception SEA, scholars and practitioners have devoted much attention to the development of techniques to facilitate its implementation. Among them Campagna and Di Cesare (2016) pointed to the potential offered by geodesign – a renewed approach for complex design problem solving – to address many of the issues encountered in SEA application. Contemporary debate on spatial planning showed an increased interest in geodesign concepts and methodology. It is in this context that Steinitz (2012) proposed his geodesign framework (GDF) as an interrelated set of models to implement forward-thinking, interdisciplinary, system-thinking design processes. Geodesign current growing interest among academic and professionals is closely related to recent advances in geospatial information and communication technologies. For decades, after the early conceptualization of Britton Harris (1989), research on Planning Support System (PSS) aimed at designing reliable integrated information system to help planners implementing digital workflows, however they had somewhat limited diffusion due to several factors including, to recall few, the limited digital literacy by professionals, the fear of blackbox effect, or, their somewhat narrow scope. Indeed, most of them focused in supporting very specific tasks of the planning and design process, at the cost of substantial resources required. More recently, the Geodesignhub PSS contributed to address the latter issue for it enabled the implementation of workflows which cover the span of the whole design process from knowledge building (in GIS) to design and impact assessment (with the system itself). In addition, Geodesignhub is designed to support collaboration and negotiation, and can record log-data about the whole process with regards to design and to the actions of the involved actors, which contribute to generate a final solution. The opportunity of making value of the geodesign (i.e. planning and design) digital log-data is unprecedented, and it worth to be investigated further as it may contribute to offer a better understanding of the process unfolding, and of its results. On the base of the above assumptions, and with the aim of making the value of the design process log-data in the following paragraph the Enhanced Adaptive Structural Theory (EAST2) by Jankowski and Nyerges (2001) was used as theoretical framework to guide the first steps of a geodesign process analysis. The log-data recorded by the by the collaborative PSS Geodesignhub during a geodesign case study were analyzed with a view to explore the dynamics of participation and interaction among stakeholders involved in a computer-mediated collaborative planning and design process. Early results are shown and discussed in the last section as a promising contribution towards a novel geodesign analytics approach.

2 METHODOLOGY

The use of the structured decision-making workflow of geodesign allows to effectively organize the key aspects of the process: the contribution of the local community within the different phases, and the use of appropriate PSS to support the implementation of specific steps. Public participation can play an important role in the overall process or may occur only at some phases previously defined, e.g. citizens are involved to integrate local and expert knowledge of the territory thus informing the design of technicians; members of the community are invited to propose change alternatives in a collaborative decision-making process. The latter case is likely to be supported by the web-based tool Geodesignhub (https://www.geodesignhub.com/) since it allows stakeholders to effectively contribute in the last three models (Steinitz, 2012) of a geodesign process. In a planning and design study with Geodesignhub - usually carried on with a two-day workshop – an ideal number of 30 participants among representatives of local community, each with their own access to the system web-based interface, can draw individual design proposals called *diagrams* to improve the

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existing conditions of up to 10 relevant territorial systems. An evaluation map for each system is previously built on the basis of expert and/or experiential knowledge. The participants divided into stakeholder groups can easily select *diagrams* to develop a composite design alternatives (*syntheses*) in line with their specific change priorities. Early design proposals are then assessed against their impacts over the existing conditions to frame refined *syntheses* before starting the negotiation phase. Geodesignhub supports stakeholder coalitions in creating negotiated *syntheses* towards achieving a consensus thanks to the availability of specific tools for the purpose.

In Geodesignhub the entire process, as briefly described above, is recorded in the database structure and all the created *diagrams* are available for download. Geodesignhub stores the spatial and temporal information associated with a *diagram*, but also thematic attributes (e.g. authorship, relevant territorial system, authors' preferences), and multimedia contents, if available. Furthermore, the design evolution can be traced back by downloading group/coalition *syntheses* created throughout the entire process, which contains information on the selected *diagrams*, the change team who created it and the exact timing.

In a post-workshop phase, thanks to the process log-data preparation and organization in a geodatabase (Fig. 1), it is possible to explore the various analytical dimensions using spatial analysis, geoprocessing tools and statistical software. However, in order to make value out of the data, the analyses required a novel ad-hoc approach for planning process data have a peculiar structure which differs from tradition spatial information (i.e. location and features thematic attributes) for it integrates design but also social-behavioural information.

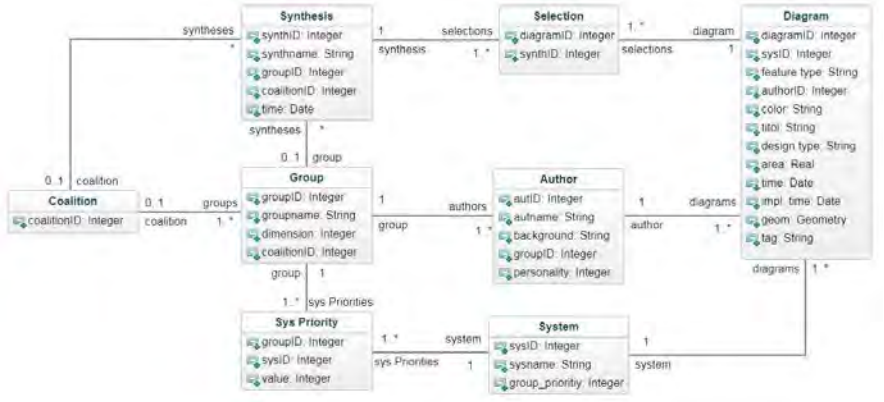

Fig. 1 The relational model of the geodesign process log-data geodatabase

This study, which is still in its early stages, ultimately aims at identifying and understanding design dynamics within a geodesign project, whereas a wider set of analytical dimensions is nowadays made available through new digital technologies. A deductive-inductive approach is adopted which drew upon both process and design theories to formulate research questions, and bottom-up exploratory empirical log-data analyses to verify potential relations between dimensions.

Various theories can be used to frame the concepts and relationships that motivate questions about planning process dynamics. Among potentially useful theoretical frameworks, EAST2, in its latest version, as proposed by Jankowski and Nyerges in 2001 can be of substantial support. EAST2 is based on eight analytical perspectives (*constructs*) subdivided in 25 *aspects*, which outline significant issues for characterizing

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collaborative decision making. In addition, seven *premises* describe the relations between the eight perspectives. This approach can be used both i) to develop a comprehensive description of each phase of the decision strategy helping to select/develop appropriate support tools and methods, or ii) to understand already developed empirical case studies practically, and researching the social and design dynamics of the decision process. In the former case, the proposed approach is relevant to the concept of Metaplanning (Campagna, 2012, 2016), defined as the planning and scheduling of the operational flow of activities, by actors, with methods and tools necessary for implementing the decision-making process. Campagna argues that a preliminary design effort can help unpacking the complexity of spatial planning process situations, avoiding imprecisely formulated activities and promoting the integration of customized supporting technologies suitable for each specific activity and task. In the latter case, a set of research questions arising from the conceptual map help understand human-computer-human interaction when using PSS. In fact, the 25 *aspects* of EAST2 linked together in different ways by the *premises* can "map" different relationships. Hence, each research question asks something about how a subject aspect relates to an object aspect, thus many different questions could be formulated.

EAST2 theory can support the appropriate variables operational identification for each research question and implement studies to test the hypothesis. Jankowski and Nyerges (2001) conducted various case studies and laboratory experiment to test the theoretical framework. The research strategy adopted highly depends on the identified research questions (motivated by relevant premises), and on the data collection techniques. The studies reported in their book (Jankowski & Nyerges, 2001) were developed using the supporting technology available at that time which, unlike the case of such tools as Geodesignhub, were not able to recording and storing digital information on the planning process systematically. Hence, more or less pre-structuring techniques have been used to gather data about the *constructs* (variables) appearing in research questions.

In this context, the use of the data storage functions of Geodesignhub is proposed here to enrich the gathering data strategy of EAST2, as a complement to more traditional tools for data collection (e.g. survey, interview, video recording). Data recorded during a geodesign workshop held by the authors are, therefore, employed to test whether EAST2 can provide the theoretical basis to develop an operational framework for Geodesign process analytics. A set of research questions steaming from EAST2 framework were formulated looking also at what data the collaborative PSS Geodesignhub could offer in terms of analytical dimensions. In Tab. 1 an example strategy for a research question articulation is set out in detail.

PREMISE	RESEARCH QUESTION
Premise 5. Group processes (construct 5) have an effect on the types of influences that emerge during those processes (construct 6), and emergent influences affect the appropriation of influences (construct 4).	Does idea exchange as social interaction affect the emergence of group participant influence?

Tab. 1 The strategy for research questions articulation

In particular premise 5 states that group processes (i.e. decision and participatory strategies adopted) affect the emergence of new information, values, objectives, rules, and consequently change the appropriation acts (e.g. appropriation of group participant influence). Making these concepts and relationships explicit motivates the following research question: does idea exchange as social interaction during a participatory process affect the emergence of group participant influence? In order to test our assumption through an exploratory approach, variables were identified and selected from those recorded in the log-data of the geodesign workshop to develop Alternative Futures for the Metropolitan Area of Cagliari, Italy. Applying

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statistical analysis to the variables organized in the geodatabase, it was possible to explore the trend of the global evolution of the syntheses created along the geodesign process by each change team (Fig. 2a). The chart shows how the number of diagrams grows moving from the first to the third synthesis. As highlighted by Steinitz (2012) the first design synthesis is usually never the final one due to inherent limits of a first draft. Therefore, during the geodesign workshop, each of the six stakeholder groups was asked to shortly present its initial proposal and then to produce iteratively three rounds of revisions. Fig. 2b shows how in the early syntheses the teams focus more on systems according to their highest priority, while in the following revisions they broaden the scope of the design including diagrams from systems of lower priorities addressing new emerging issues. In fact, the Cagliari workshop, in the last two syntheses, four of six groups have selected a greater number of diagrams from those systems, that they have defined of medium or low priority following their initial objectives.

From the data analysis it is reasonable to assume that the iterative design process help the participants to enhance their understanding of the issues and opportunities for change. The presentation of the *syntheses* of the different team, although usually based on a different set of priorities may be a complementary but important part of the learning process within each team and among teams. Despite the fast pace with which these steps are carried on, the ideas exchange as fundamental phase workshop can i) facilitates dialogue and mutual learning between stakeholder groups as suggested by transactive planning theory (Friedmann, 1981), and ii) broaden the different shareholders' interests as it seems demonstrated by these first analysis.

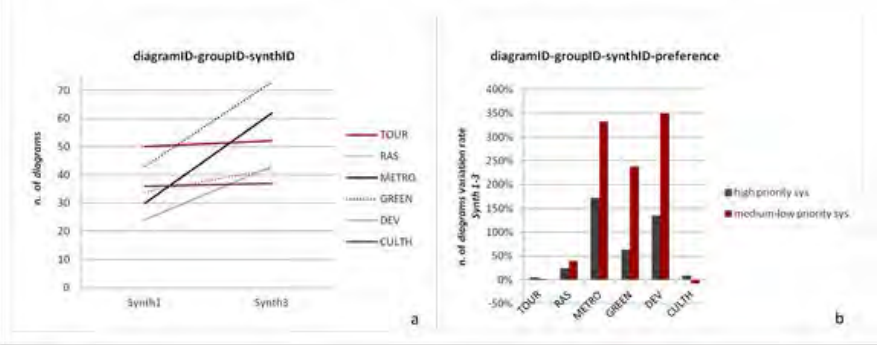

Fig. 2 Early quantitative measures of the GDH process dynamics. (a) Global evolution of the initial syntheses for each group; (b) variation rate of the number of *diagrams*, respectively in high and medium-low priority systems

3 CONCLUSIONS

This paper summarizes the early results of an ongoing research endeavour carried on by the authors aiming at defining a digitally based operational analytics framework for understanding planning and design processes. A new source of data, that is log-data gathered digitally during geodesign workshops thanks to the functionalities of the Geodesignhub PSS, was used to test the hypothesis. Early results suggests a huge potential for making value of available data for earning new insight about the collaborative design generation and about social design process dynamics.

Further research is definitely needed to define a robust geodesign process analytics, possibly leading to a better understating of general patterns and behaviours in planning and design processes. Nevertheless, early results suggests the possibility in the short-medium term not only to make past process more transparent,

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but also to monitor ongoing processes real-time assembling process performance indicators in digital dashboard. If this approach will give the expected fruits it may eventually contribute to gather new knowledge useful for the design of future collaborative planning and design initiatives through Metaplanning.

REFERENCES

Arcidiacono, A. (2012). Piani comunali, progetti e VAS in Lombardia: da complicato adempimento a chiaro manifesto di obiettivi. In C. Zoppi (Ed.), *Valutazione e pianificazione delle trasformazioni territoriali nei processi di governance e e-governance* (pp. 159-174). Milan, it: Franco Angeli.

Arnstein, S. R. (1969). A Ladder Of Citizen Participation. *Journal of the American Planning*, *35*(4), 216-224. doi: https://doi.org/10.1080/01944366908977225

Campagna, M. (2012). Geodesign, sistemi di supporto al piano e metapianificazione. *DISEGNARE CON, 6*, 133-140. doi: https://10.6092/issn.1828-5961/3407

Campagna, M. (2016). Metaplanning: About designing the Geodesign process. *Landscape and Urban Planning*, *156*, 118-128. doi: https://10.1016/j.landurbplan.2015.08.019

Campagna, M., & Di Cesare, E. A. (2016). Geodesign: Lost in Regulations (and in Practice). In R. Papa and R. Fistola (Eds.), *Smart Energy in the Smart City. Green Energy and Technology*. Cham, CH: Springer. doi: https://doi.org/10.1007/978-3-319-31157-9_16

Chaker, A., El-Fadl, K., Chamas, L., & Hatjian, B. (2006). A review of strategic environmental assessment in 12 selected countries. *Environmental Impact Assessment Review*, *26*(1), 15-56. doi: https://doi.org/10.1016/j.eiar.2004.09.010

COWI (2009). *Study concerning the report on the application and effectiveness of the SEA Directive (2001/42/EC)*. European Commission, DG ENV.

Fischer, T. (2010). Reviewing the quality of strategic environmental assessment reports for English spatial plan core strategies. *Environmental Impact Assessment Review*, *1*(30), 62-69. doi: https://doi.org/10.1016/j.eiar.2009.04.002

Forester, J. (1999). *The Deliberative Practitioner: Encouraging Participatory Planning Processes*. Cambridge, USA: MIT Press.

Friedmann, J. (1993). Toward a non-Euclidian mode of planning. *Journal of the American Planning Association*, *59*(4), 482-485. doi: https://doi.org/10.1080/01944369308975902

Gauthier, M., Simard, L., & Waaub, J. P. (2011). Public participation in strategic environmental assessment (SEA): Critical review and the Quebec (Canada) approach. *Environmental Impact Assessment Review*, *31*(1), 48-60. doi: https://doi.org/10.1016/j.eiar.2010.01.006

Harris, B. (1989) Beyong Geographic Inforamtion Systems. *Journal of the American Planning Association*, *55*(1), 85-90.

Jankowski, P., & Nyerges, T. (2001). Geographic Information Systems for Group Decision Making. London, UK: Taylor & Francis.

Khakee, A. (1998). Evaluation and planning: inseparable concepts. *Town Planning Review*, *69*(4), 359-374. doi: https://doi.org/10.3828/tpr.69.4.3803q86489619xm7

Khakee, A. (1999). Participatory scenarios for sustainable development. *Foresight*, *1*(3), 229-240. doi: https://doi.org/10.1108/14636689910802160

Parker, J. (2007, April 03-04). *Strategic Environmental Assessment and SFs Operational Programmes: An assessment. DG Environmental European Commission presentation at Aarhus Workshop on Public Participation in Strategic Decision-Making (PPSD)*. Sofia, Bulgaria.

Rega, C., & Baldizzone, G. (2015). Public participation in Strategic Environmental Assessment: A practitioners' perspective. *Environmental Impact Assessment Review*, *50*, 105-115. doi: https://doi.org/10.1016/j.eiar.2014.09.007

ISBN:978-88-6887-048-5
DOI:10.6093/978-88-6887-048-5

Steinitz, C. (2012). *A Framework for Geodesign. Changing Geography by Design*. Redlands, USA: Esri Press.

UNGA (United Nations General Assembly). (1992a). *Report of the UN Conference on Environmental And Development*. Rio de Janeiro, Brazil, A/CONF.151/26 (Annex II).

UNGA (United Nations General Assembly). (1992b). *Rio Declaration on Environmental And Development. Report of the UN Conference on Environmental And Development*. Rio de Janeiro, Brazil, A/CONF.151/26 (Annex I).

UNGA (United Nations General Assembly). (2015). *Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015*. A/RES/70/1

UN-WCED (United Nations World Commission on Environment and Development). (1987). *Our Common Future (Brundtland Report)*. Oxford University Press.

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Antonio Leone Carmela Gargiulo
Editors

Environmental and territorial modelling for planning and design

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This book collects the papers presented at the 10th International Conference INPUT 2018 which will take place in Viterbo from 5th to 8th September. The Conferences pursues multiple objectives with a holistic, boundary-less character to face the complexity of today socio-ecological systems following a systemic approach aimed to problem solving. In particular, the Conference aims to present the state of art of modelling approaches employed in urban and territorial planning in national and international contexts.

This book is the latest scientific contribution of the "Smart City, Urban Planning for a Sustainable Future" Book Series, dedicated to the collection of research e-books, published by FedOAPress - Federico II Open Access University Press. The volume contains the scientific contributions presented at the INPUT 2018 Conference and evaluated with a double peer review process by the Scientific Committee of the Conference. In detail, this publication, including 63 papers grouped in 11 sessions, for a total of 704 pages, has been edited by some members of the Editorial Staff of "TeMA Journal", here listed in alphabetical order:

- Rosaria Battarra;
- Gerardo Carpentieri;
- Federica Gaglione;
- Rosa Anna La Rocca;
- Rosa Morosini;
- Maria Rosa Tremiterra.

The most heartfelt thanks go to these young and more experienced colleagues for the hard work done in these months. A final word of thanks goes to Professor Roberto Delle Donne, Director of the CAB - Center for Libraries "Roberto Pettorino" of the University of Naples Federico II, for his active availability and the constant support also shown in this last publication.

Rocco Papa
Editor of the Smart City, Urban Planning for a Sustainable Future" Book Series
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INTRODUCTION

Between 5th and 8th September 2018 the tenth edition of the INPUT conference took place in Viterbo, guests of the beautiful setting of the University of Tuscia and its DAFNE Department.

INPUT is managed by an informal group of Italian academic researchers working in many fields related to the exploitation of informatics in planning.

This Tenth Edition pursed multiple objectives with a holistic, boundary-less character, to face the complexity of today socio-ecological systems following a systemic approach aimed to problem solving. In particular, the Conference will aim to present the state of art of modeling approaches employed in urban and territorial planning in national and international contexts.

Moreover, the conference has hosted a Geodesign workshop, by Carl Steinitz (Harvard Graduate School of Design) and Hrishi Ballal (on skype), Tess Canfield, Michele Campagna.

Finally, on the last day of the conference, took place the QGIS hackfest, in which over 20 free software developers from all over Italy discussed the latest news and updates from the QGIS network.

The acronym INPUT was born as INformatics for Urban and Regional Planning. In the transition to graphics, unintentionally, the first term was transformed into "Innovation", with a fine example of serendipity, in which a small mistake turns into something new and intriguing. The opportunity is taken to propose to the organizers and the scientific committee of the next appointment to formalize this change of the acronym.

This 10th edition was focused on Environmental and Territorial Modeling for planning and design. It has been considered a fundamental theme, especially in relation to the issue of environmental sustainability, which requires a rigorous and in-depth analysis of processes, a theme which can be satisfied by the territorial information systems and, above all, by modeling simulation of processes.

In this topic, models are useful with the managerial approach, to highlight the many aspects of complex city and landscape systems. In consequence, their use must be deeply critical, not for rigid forecasts, but as an aid to the management decisions of complex systems.

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