ID 1515 | COLLABORATION IN PLANNING: THE GEODESIGN APPROACH

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1 INTRODUCTION

Planning literature proposes different paradigms (Khakee, 1998) for interpreting the concept of public participation in spatial planning, ranging from early advocacy planning approaches (Davidoff, 1965) to more recent communicative ones (Innes, 1995). Different approaches highlight different perspectives on participation, including expression of pluralist community views, preferences, and values, creation of better knowledge, better transparency, and more consensus in decision making. While the Arnstein's Ladder (1969) can be still considered a reliable model to describe different degree of participation, ranging from none to full citizen control, most recent studies propose its revised application to the realm of current digital practices in spatial planning (Kingston, 1998; Carver, 2001). As shown in figure 1, Kingston (1998) and Carver (2001) argue that the highest levels of participation are achieved when citizens are actively involved in designing possible alternatives and in making decisions. However, the latter models did not contribute much to clarifying how public participation intervenes within the different phases of a planning process. Indeed, the contribution of the local community, or the people of the place (Steinitz, 2012) can affect different stages and tasks of the process: local knowledge can be collected to integrate with expert surveys, aimed at the description of the current state of the environment and of the ongoing territorial dynamics; the interests and needs of the citizens can be encoded in risk and/or suitability analyses aimed at guiding the design of future alternatives; or members of the local community can collaborate to propose changes, to assess their impacts and eventually take part to decision-making. Having a clear framework in mind can help everyone to better understand these facets and possibly to better understand the opportunities and functioning of public participation in spatial planning, design, and decision-making.

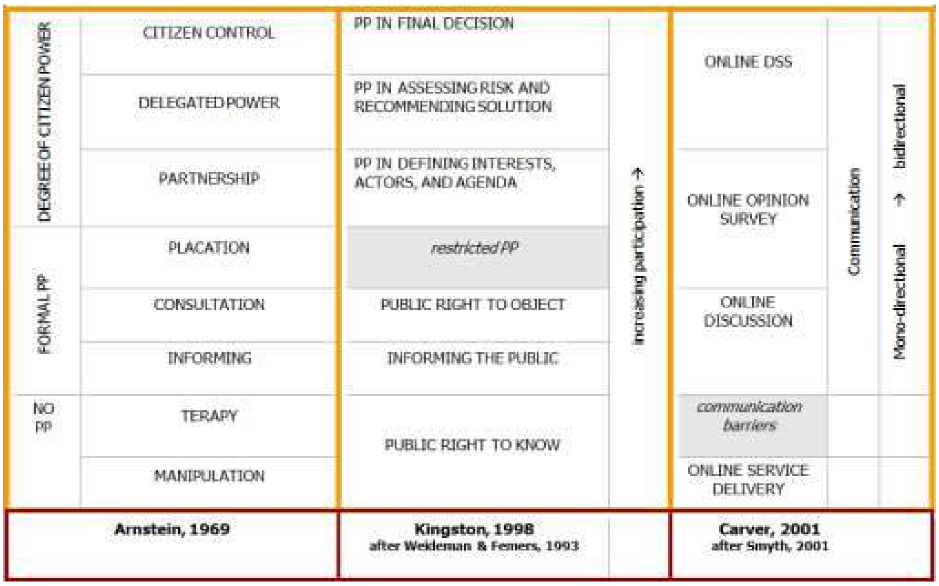

Fig. 1: The Arnstein's Ladder of citizen participation revisited in the information age.

In the light of the above premise, this paper describes the process of a Geodesign workshop held in May 2016 on the future of the Cagliari Metropolitan Area in Italy. The workshop shows how it is possible to involve teams of members of the community in what is perhaps the most critical (and least understood in its dynamics) phase of a spatial planning process, that puts knowledge into action through the design of future change alternatives. After the Geodesign framework (Steinitz, 2012), which informed the Cagliari Geodesign study, is outlined in section 2, section 3 shows how the process unfolded, from data preparation to the creation of a final agreed design solution. Section 4 proposes a final review of the results and issues for further research.

2 THE GEODESIGN METHODOLOGICAL APPROACH

Geodesign (GD) is a novel methodological approach to design and decision-making in urban and regional planning which is deeply rooted in the geographical sciences. While not strictly essential, Geodesign usually relies on extensive use of (geographic) digital methods and tools. In general, Geodesign can be defined as a process which integrates analysis, evaluation, design and decision support techniques using enabling technologies for planning built and natural environments. Given the complexity of the issues commonly involved in planning processes, Geodesign studies should ideally be carried out by multidisciplinary teams made up of design professionals, experts in the geographical sciences, information communication technology specialists, and, last but not least, members of the local community, who can provide invaluable knowledge and values to inform design and to help create consensus on decisions. From the perspective of methodology, Steinitz (2012) proposed an operational framework for Geodesign (GDF) which starts from detailed representation and analysis of the territorial context aimed at understanding territorial dynamics, in order to understand opportunities and risks of development, so informing the design of possible future states or courses of actions. The framework also includes assessment of potential impacts of change which should inform negotiation during the decision-making process in a collaborative and interactive manner. All the aspects of participation (e.g. knowledge building, collaboration, expressing values and interests, mediation, negotiation, consensus) which inform different participatory planning models (e.g. advocacy planning, transactive planning, communicative) (Khakee, 1998) may potentially be included. However, a Geodesign process is never the same: it should always be tailored to the local context through meta-planning (Campagna, 2016a). Thus, participation may assume many different facets in its application to local processes.

Implementation of Geodesign in spatial planning at various scales and within different contextual settings for decision-making has been tested by Steinitz in many case studies (among them Rivero et al 2015, Nyerges et al. 2016, Campagna et al. 2016), based on his framework. The GDF is structured in six models: the first three models, constitute the assessment phase, describing the current conditions of the territorial context and their possible evolution without new actions, while the last three models, constitute the intervention phase, which aims to identify how the study area should be altered in order to improve the current conditions if needed.

More specifically the Representation Model (RM) describes the study area in its current state, the Process Model (PM) identifies and analyses the possible evolution of the territorial context with no interventions (i.e. the do-nothing alternative), while the Evaluation Model (EM) assesses the identified processes in order to find possible risks and opportunities for future change. Then, in the assessment phase, a Change Model (CM) is built to design possible alternative future states for the study area, which are then assessed in order to find potential environmental, economic or social impacts through the Impact Model (IM). Eventually consensus among the decision-makers and the other stakeholders on a final choice can be achieved through a negotiation process which is supported by a Decision Model (DM). While the process is not necessarily strictly linear, to perform a complete Geodesign, study three iterations should be undertaken, driving the six models from the first to the sixth, or in reverse order. The first iteration aims to identify the case study purpose and this can be considered as a scoping of the study; the second iteration passes through the six steps in reverse order and should clearly define how to carry out the study in terms of methods and tools depending on the needs of the specific planning study This can be considered as a meta-planning phase. Then, during the third iteration, the study is fully carried out. During a study, the results of the design and the impact analysis can be shared among the stakeholders and visualized in form of maps, charts and graphs (Ervin, 2011) to aid participation. Feedback offers the stakeholders the possibility not only to improve their own designs, but also to collaborate to reach a solution acceptable to all parties.

The application of the Geodesign methodological approach seems to be currently highly relevant because of its strong potential to positively affect the way planning processes should be carried out in Europe according to the Directive 2001/42/EC on Strategic Environmental Assessment. Geodesign can contribute to addressing many of its current pitfalls (Campagna and Di Cesare, 2016), including those relating to the involvement of the public in the decision-making process, which are most relevant to this paper.

3 THE CAGLIARI WORKSHOP

The “Geodesign Workshop on Future Scenarios for the Cagliari Metropolitan Area” took place in May 2016 at the Civil and Environmental Engineering and Architecture Department (DICAAR) of the University of Cagliari (UniCA), Italy, in the form of two intensive planning studio days. The Geodesign Framework was customized to the local decision-making context in order to develop collaborative sustainable future scenarios for the Cagliari Metropolitan City, recently established by Sardinian Regional Law n. 2/2016. The new metro area is located in the southern coastal part of Sardinia (Italy) and is composed of 17 municipalities. Workshop preparation started in January 2016 with close cooperation in the local coordination team, which included a dozen local experts in architecture, planning and environmental engineering, including the authors of this paper.

During the first phases of the study, the coordination team identified the boundaries of the study area and its relevant territorial context, primary goals for its future development, and the main ongoing territorial dynamics: the scoping phase of the study (i.e. the first iteration through the framework). Second, the methods and the tools to be used in the Geodesign models implementation were selected (i.e. second iteration). Next, the representation, process and evaluation models were built (i.e. third iteration). It should be noted that this part of the process was implemented by the Geodesign team of experts, but citizen participation could have been part of these phases if the study had been organized differently. In order to carry out the intervention phase (i.e. CM, IM, DM) of the third iteration of the GDF, an intensive two-day workshop was organised. Thirty-two people, including academics, technical representatives of public authorities, local planning professionals, and students of architecture and civil engineering participated. The group was selected on the basis of the two main objectives of the workshop: to understand and further test the application of the Geodesign methodology, and to rapidly identify central issues, options and choices as a basis for further studies and planning.

In order to simulate local decision makers, the participants were divided in six teams representing major local stakeholder groups. All of them played a primary role in the design and during the intervention part of the GDF third iteration. The coordination team, who had prepared the early phases of the study, limited its role to coordination at this stage.

The collaborative work was supported by a web based application called Geodesign Hub (www.geodesignhub.com). Its architecture combines the concepts of Planning Support Systems (PSS) (Harris 1989) and web 2.0 principles to perform in an integrated and collaborative way the last three models of the GDF. It uses the representation, process and evaluation models, previously prepared with professional GIS desktop application by the coordination team, as input. Geodesign Hub represents a promising way to approach the complexity of the participatory design and decision-making processes. A more detailed review of the capabilities of Geodesign Hub as compared to other similar planning support tools can be found on the “Sketch Planning Tools for Regional Sustainability” report (Avin, 2016). Indeed, it integrates state of the art technologies into the Geodesign workflow, contributing through a user-friendly interface and social networking capabilities the means to facilitate the collaboration of non-expert participants of various backgrounds and skills, to work intuitively and quickly on design and negotiation.

4 THE CAGLIARI METRO AREA

Since Italian Law 7 April 2014 n.56 became effective, some Italian cities and their suburbs formed a new local government level, the so called “metropolitan cities”. Given its special status of Autonomous Region, the Sardinia Regional Government had to transpose the national principles relating to the establishment and management of these new jurisdictions. Accordingly, the Regional Law 4 February 2016 n.2 created the Cagliari Metropolitan City, defining its functions and responsibilities, as well as its boundary, which includes 17 municipalities around the region’s capital. From the spatial government perspective, a metropolitan strategic plan should be adopted as a regulatory and coordination tool for the development of the area. The workshop represented the first design effort to understand central design issues, opportunities and options.

The area, located along the southern coastal edge of Sardinia, Italy (Figure 1), represents an important economic and social attractor for the whole island. In addition, during the last decade the number of tourists visiting the region increased. Thanks to its location on the lower fertile plain of Campidano and facing the gulf called Golfo degli Angeli, the Cagliari Metropolitan City contains highly diverse natural and cultural landscapes and offers a rich variety of agricultural and fishery activities that characterized the important food tradition of the whole region (Figure 2). The area has the highest population density in Sardinia; however, the landscape is not affected by excessive vertical or volumetric occupation. In 2011, the total population was approximately 420.000 people (Census ISTAT 2011). According to the 25-year demographic projections carried out by the coordination team until 2036 (the established time horizon for the study), there will be a growth of about 25.000 inhabitants (i.e. growth rate +0.055). An additional moderate population growth was considered as a result of policies included in the pro-development scenario of this study, resulting in an estimated total of 50.000 new people in a +25-year target.

Fig. 2: The Cagliari Metropolitan City.

Fig. 3: Cagliari Metropolitan City landscapes.

5 PRE-WORKSHOP PHASE

The workshop organization was carried out by the local coordination team, with the aim of constructing the knowledge base (i.e. RM, PM, EM) in a consistent format with the Geodesign Hub input requirements. The first step was to specify three main objectives for the Cagliari Metro Area development scenario in a twenty-five year time horizon:

- Tourism development: intended as the valorization of existing coastal tourism facilities and their improvement in less equipped areas;
- Agrifood: intended as the valorization of the local agricultural areas, promoting sustainable agriculture, and also the implementation of new tourist itineraries connected to agricultural, scenic and cultural assets, traditional production methods, and gastronomic heritage. This objective aims both to extend the tourist offering and to keep the rural territory alive;
- Cagliarifornia: intended as the creation of an ICT industry pole able to create new job opportunities and to attract new population, given the presence in the area of existing industry in this domain.

In order to describe the main characteristics of the territorial context, ten spatial systems were selected. The choice was based on analysis of the regulatory framework, and adapted to the development scenario. Three vulnerability systems were chosen, namely: cultural heritage (CULTH), ecology (ECO), and hydro-geological hazard (HYDRO). In addition seven attractiveness systems were considered: tourism (TOUR), agrifood (AGRI), transport (TRASP), low density housing (LOW-H), high density housing (HIGH-H), commerce and industry (COMIND), and smart services (SMRT). Each system was analysed starting from the description of its current condition (i.e. RM) and its evolution dynamics (i.e. PM), to the evaluation of the territory in terms of each system (i.e. EM). This gave workshop participants ten evaluation maps (Figure 4) to inform the design. All the EM maps were created by experts through land suitability analyses in a desktop GIS environment, with the aim of identifying the overall resource supply of the territory. The preparatory phase of the workshop (the first part of the geodesign study process) was carried out using a typical rational comprehensive planning approach (as defined in Khakee, 1998). However, while most of the spatial information used to create the knowledge base was retrieved from the Regional Spatial Data Infrastructure (R-SDI), in this phase the coordination team decided to test the use of passive social media geographic information (Campagna, 2014; 2016b) IThe TOUR evaluation model was informed by the indirect preferences expressed by social media users to different tourism locations. The use of social media to account for public values and preferences can be considered a form of input by the community, though involuntary.

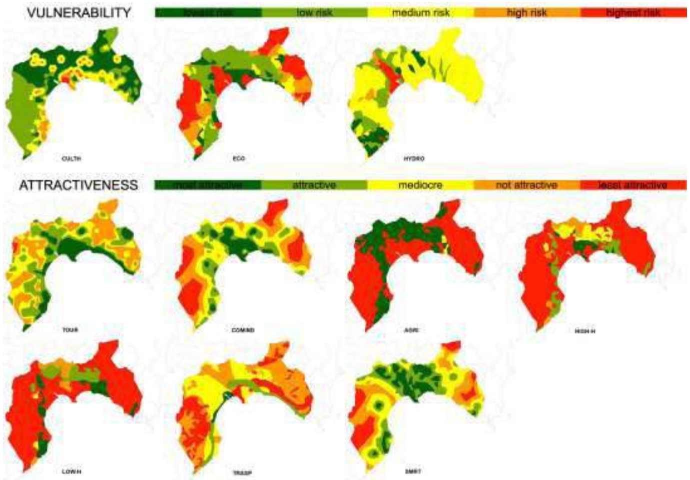

Figure 4. The ten evaluation maps.

The ten EM maps adopted the same color code. The vulnerability maps classified the study area in five vulnerability levels, where red areas indicated those characterised by a very high vulnerability, in which only actions aimed at preserving these sites can be permitted, and the dark green areas are the least vulnerable ones, in which do not present any restriction in use. Likewise, the seven attractiveness maps classified the study area into five levels, but in this case the dark green colour identified very highly attractive areas for developing action in that system, and areas depicted in red identified those of very low attractiveness. The ten EM maps were then uploaded in the GDH platform as a common knowledge base to inform the design. The design then became the responsability of the workshop participants, initiating the particiaptory part of the study.

In addition, as part of the assessment phase, a cross-systems impact matrix was compiled by the local coordination team to identify the positive or negative impacts of each single change action on over the ten systems (Figure 5). This matrix was also uploaded in the platform, enabling real-time calculation of the performance of each design proposal during the workshop.

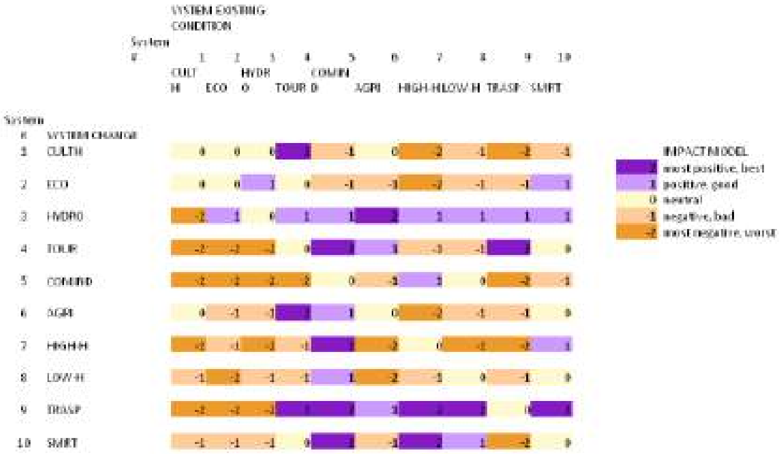

Figure 5. Cross-systems impact matrix.

6 THE WORKFLOW OF THE GEODESIGN WORKSHOP

A total of thirty-two participants were selected by the organizers to form a multi-disciplinary team, including scholars, students and local stakeholders from the public and the private sectors. As an introduction to the upcoming workshop, an open lecture given by Carl Steinitz was organized at the University of Cagliari to present the Geodesign concept and framework and their application in a number of previous international case studies. At the very beginning of the workshop the local coordinator introduced the study area, the main objectives of the development scenarios, and the ten evaluation maps, which were already available as a digital common knowledge base from which to start their design. As emphasized before, the Geodesign approach provides a workflow based on applying territorial knowledge to address planning problems from an interdisciplinary point of view, and to make informed and evidence-based designs and decisions.

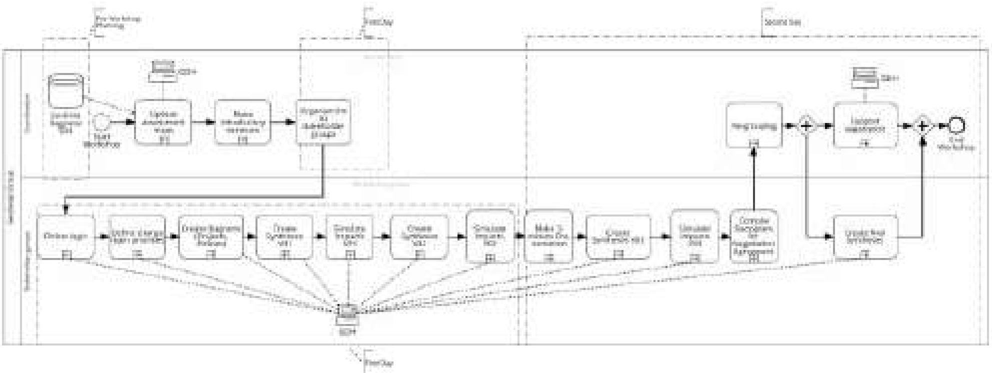

Figure 6. The workshop workflow represented in BPMN annotation.

GROUPS	
Metropolitan government	METRO
Regional government	RAS
Green NGO	GREEN
Cultural Heritage Conservation	CULTH
Developers	DEV
Tourism Entrepreneurs	TOUR

Table 1. The six stakeholder groups.

The organizing team established the workshop schedule, which concentrated complex design tasks into an intensive and time-constrained workflow agenda (Figure 6). A collaborative PSS is most useful when applied at the beginning of a study of considerable complexity. Given the scale and complexity of the Cagliari metro area and the number of actors involved, the conductor emphasized that in this phase of the planning process speed is more important than accuracy. In the first phase, the participants were arranged in six groups, each one with a different viewpoint to guide their decision-making, (Table 1 and Figure 7) and with at least one member of the local staff offering technical support and advice throughout the process.

Figure 7. The six teams and their locations in the classroom.

Each member of each team logged-in and got familiar with the online GDH platform. The first task that needed to be carried out was the definition of each group's change priorities according to their specific role and interests in the decision process (Figure 8). They were asked to prioritize -in rank order -the ten systems, through discussion or by using methods for consensus-building (e.g. Delphi Method).

Figure 8. The different Decision Models for the six groups.

Participants in each team were asked to produce a number of geo-referenced diagrams each one representing a conceptual design proposal related specifically to its system. This marked the beginning of the design part of the study, where participants could exploit the innovative potential of the GDH PSS. GDH enables two types of design interventions: projects and policies (Figure 8). Projects are a proposed physical change in the territory shown by a solid block of color, while policies represent decisions and actions that will not have a physical expression, and are shown by areas of color hatching. The GDH platform includes sketching tool for drawing lines and polygons, and visualises changes in the geographic space in real-time, facilitating the assessment of their impacts. Expert and experiential spatial knowledge acquired during the assessment phase of the Geodesign Framework directly influences the change models by giving guidance to the designers. The EM maps were available as base maps in the software design window, providing a color-coded evaluation of the current development opportunities and risks in the area for each of the ten systems. The proposed projects and policies, referred to as diagrams, could be created by an individual stakeholder's initiative or as the result of early negotiations among team members.

Figure 9. Projects (left) and policies (right) examples with the Evaluation Models of the related system as base map.

About 200 diagrams were created in this first stage. They were systematically organized in a matrix by the software, positioned in the column of the related system in chronological order of creation, and shared in real time among all the participants. At the end of the first morning, each group was asked to select a group of projects and policies (a synthesis) in line with their development goals and interests from all 200 diagrams in order to create their first change scenario. The GDH online platform not only supports rapid syntheses, but it also computes real-time impact assessments providing immediate feedback on a scenario's performance, creating the opportunity to rapidly revise the choices (Figure 10). More specifically, a series of maps and histograms shows: i) the direct impact of change in one system both on itself and on the other systems on a three-value scale, from positive (i.e. purple) through neutral (i.e. yellow) to negative (i.e. orange); ii) how the designs perform in light of the target goals; iii) the total cost of implementation. Furthermore, the tool enables dynamic updates to the evaluations maps as the synthesis is assembled, instantly displaying the connections between systems and the changes over the initial conditions.

Figure 10. Real-time impact assessment visualization.

Steinitz (2012) argues that the first design will never be the best one and that the synthesis process should be repeated at list three times to find an improved alternative: the second synthesis is usually better than the first one, and the third is usually the best. Hence, the possibility to rapidly revise and assess the change models represents one of the central advantages of using digital Geodesign technologies to support dynamic workflow. Accordingly, a second and a third design cycle took place, and the six teams could quickly and easily change their syntheses by modifying or creating new diagrams and adding or removing projects and policies until an agreed solution with acceptable impact performance was found.

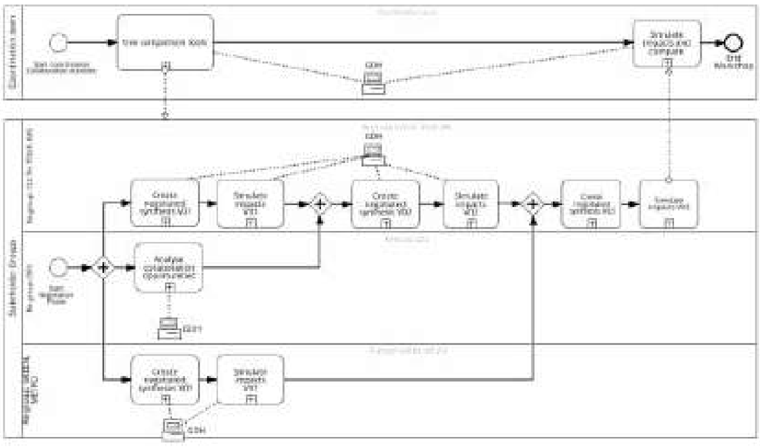

Figure 11. The negotiation phase described with BPMN annotation.

After each round of syntheses was completed, each team leader made a three-minute presentation to explain the main features of her/his group design synthesis. It was possible to notice how in the evolution from the first to the third version, the designs were gradually moving in some cases towards more similarity, in others towards highlighting conflicts At this stage, the tools in Geodesign Hub for effective visual or quantitative comparison of the alternative scenarios facilitated the early stages of the negotiation process (Figure 11). Eventually, not without some vigorous discussions, the teams reached agreement on a final synthesis.

Figure 12. The scenarios comparative tool showing the impacts performance of the six designs at their third version.

Maps and graphs enabled the participants to analyze more deeply each design version and to find differences and affinities between the groups (Figure 12). This comparative analysis greatly facilitated the efficient utilization of coalition/sociogram techniques (Rivero et Al, 2015) with the aim of identifying compatibility or conflicts between the groups. The tool is a matrix where each team could give a value from -2 (disagreement) to +2 (complete agreement) to the other groups according to the compatibility of their designs (Figure 13).

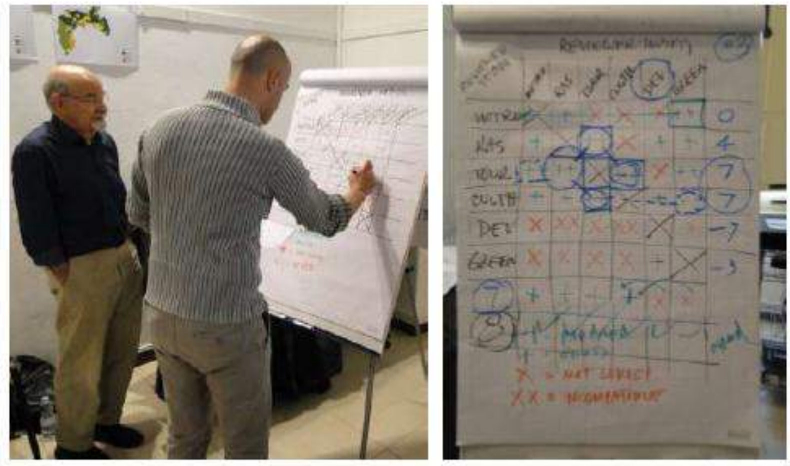

Figure 13. The Sociogram for Negotiation Agreement.

The results obtained by this approach immediately showed a first coalition that led the stakeholder teams of TOUR, CULTH and RAS to join together in a super-group displaying strong affinity among them. A second less robust alliance was formed between GREEN and METRO. The Developers remained outside the coalition-building process obtaining negative assessments from all the other teams. The two affinity groups started their negotiations, while the Developers, at first, began to think about how they should move forward on this particular situation. They eventually decided to accept compromise and to collaborate with the strongest group. Agreement for Cagliari metro area future development was reached within the coalitions through dialogue and mutual understanding which resulted in the creation of two alternatives and combined solutions. Because of the noticeable convergence towards similarities in the two designs at that point, a third process of negotiation was launched among all the participants aimed at agreeing a single final design. In such a situation, the conductor played an important role in the collaboration/negotiation phase by encouraging mutual understanding, ensuring wider and more efficient communication, and avoiding bottlenecks in the process. At the end of the second day of the workshop, an agreed +25-year change design was created (Figure 14). Then, with the support of GDH visualization tools, it was compared with the frequency map which shows in a single solution all diagrams selected in at least three different alternatives during the third round of syntheses. The two maps present many common diagrams and show the same hotspots of interests.

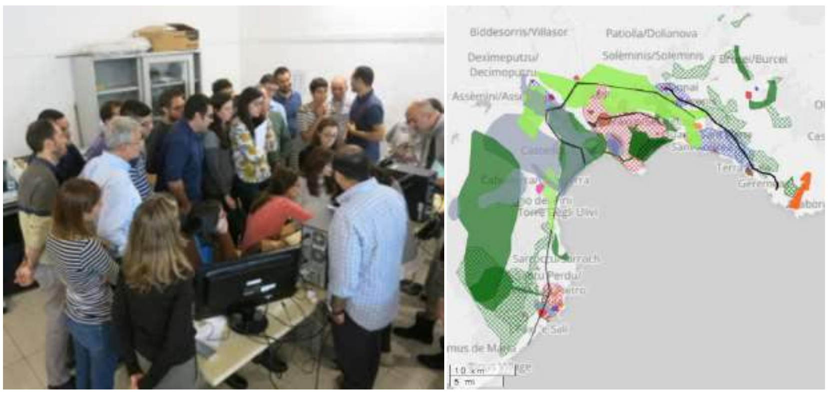

Figure 14. The negotiation process among the stakeholders and the final change design.

7 CONCLUSIONS

Over the last two decades or less, the diffusion of internet and of information communication technologies has opened new possibilities for public participation in many government domains, including spatial planning. Overcoming space and time constraints and digital divides which exist in many countries can pose challenges. Many factors affect the success or failure of digital participation initiatives. Among them, the adoption of suitable methods and tools plays an important enabling role. Geodesign methods and related technologies seem to have broad potential for contributing to collaborative design. The study presented in this paper was developed within an academic research setting, and demonstrate the functioning of a Geodesign process and its enabling technology. Other studies using the same approach and technology proved to be successful in actual practice. Although limited in complexity, this study is useful to demonstrate and describe the functioning of the Geodesign process and its potential. The collaborative method and technology presented in this paper can support participation especially in some specific working situations such as i) when working through a framework in order to understand it, ii) when there is little time and small data, iii) when starting fast to identify central issues, options and choices, iv) when it takes an experimental design to know what the questions really are, and v) when it takes a design to understand what is really wanted. Conditions i), iii) and iv) particularly apply to the Cagliari metro area workshop. In other situations, especially in ii), extending participation into the knowledge building phase of the project, including the creation of the representation, process and evaluation models can be appropriate. The latter part can be the subject of further research, especially from the perspective of using other social media networking platforms and tools to involve the citizens in volunteering data about the physical environment, about ongoing environmental and social processes, and about community values, preferences and need.

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BIBLIOGRAPHIC REFERENCES

Avin, U. 2016. NCHRP 08-36/Task 117, Sketch Tools for Regional Sustainability Scenario Planning, 2016.

Arnstein, S. 1969. A Ladder of Citizen Participation. Journal of American Institute of Planners, 35-4: 216-224

Campagna M. 2014. The geographic turn in Social Media: opportunities for spatial planning and Geodesign. Computational Science and Its Applications–ICCSA 2014. Springer International Publishing, pp. 598-610.

Campagna M (2016) Metaplanning: About designing the Geodesign process, Landscape and Urban Planning, Available online 6 July 2016, ISSN 0169-2046, http://dx.doi.org/10.1016/j.landurbplan.2015.08.019.

Campagna, M. 2016b. Social Media Geographic Information: Why social is special when it goes spatial. In: Capineri, C, Haklay, M, Huang, H, Antoniou, V, Kettunen, J, Ostermann, F and Purves, R (eds.) European Handbook of Crowdsourced Geographic Information, Pp. 45–54. London: Ubiquity Press. DOI: http://dx.doi.org/10.5334/bax.d. License: CC-BY 4.0.

Campagna M., Moura A. C. M., Borges J., Cocco C. 2016. Future Scenarios for the Pampulha Region: A Geodesign Workshop. Journal of Digital Landscape Architecture, 1¬2016. Herbert Wichmann Verlag, Berlin/Offenbach, pp. 292-301.

Carver S. 2001. Participation and Geographical Information: a position paper. Position Paper for the ESF-NSF Workshop on Access to Geographic Information and Participatory Approaches Using Geographic Information, Spoleto, 6-8 December.

Davidoff P. 1965. Advocacy and pluralism in planning. Journal of the American Institute of Planners, 28: 331-338.

Ervin S. 2011. A system for GeoDesign. Proceedings of Digital Landscape Architecture. Anhalt University of Applied Science, pp. 145-154.

Innes J. 1995. Planning theory's emerging paradigm: communication action and interactive

practice. Journal of Planning Education and Research, 14: 183-90.

Harris B. 1989. Beyond Geographic Information Systems: computer and the planning professionals. Journal of American Planning Association. 55(1): 85-90.

Khakee A. 1998. Evaluation and Planning: two inseparable concepts. Town Planning Review, 69-4: 359-374.

Kingston R. 1998. Web Based GIS for Public Decision Making in the UK. Paper for the Project Varenius Specialist Meeting on Empowerment, Marginalization and Public Participation GIS, Santa Barbara, CA, http://www.ncgia.ucsb.edu/varenius/ppgis/papers/index.html.

Nyerges T., Ballal H., Steinitz C., Canfield T., Roderick M., Ritzman J., Thanatemaneerat

W. 2016. Geodesign dynamics for sustainable urban watershed development. Sustainable Cities and Society. Elsevier, 25: 13-24.

Rivero R., Smith A., Ballal H., Steinitz C. 2015. Promoting Collaborative Geodesign in a Multidisciplinary and Multiscale Environment: Coastal Georgia 2050, USA [In:] E. Buhmann, S. Ervin, M. Pietsch (ed.), Peer Reviewed Proceedings Of Digital Landscape Architecture 2015. Wichmann, Berlin/Offenbach, pp. 42-58.

Steinitz C. 2012. A Framework for Geodesign: Changing Geography by Design. Esri Press, Redlands, CA.

ID 1559 | MULTI-CRITERIA DECISION ANALYSIS FOR PROMOTING BIKE-FRIENDLY CITY VISION OF IZMIR USING GIS

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ABSTRACT: Deploying GIS at its analysis of multilayered spatial data about Izmir (the third biggest metropolitan city in Turkey), this paper aims at suggesting ways of providing bicycle routes and roads in the already developed built environment of the densely populated cities. Focusing on multiple characteristics of topography, land use and population, the study deploys overlay analysis and network analysis respectively at city level and district level. Despite of the limited number and characteristics of data available about Turkish cities, this study has been limited to the lack of crime data and travel demand data of related neighborhoods.

1 INTRODUCTION

Bicycle use is widely promoted by many researches and policy initiatives of industrialized countries as the efforts related to sustainable development, carbon-free and non-motorized transportation and "healthy" cities. While some of these policies and researches relate to promoting changes in lifestyles and habits of physical activities (eg., Wendel-Vos, Schuit, De Niet, Boshuizen, Saris, Kromhout, 2004), others focus majorly on planning and design of built environment and of transportation systems (e.g., Huang & Ye, 1995; Rodriguez & Joo, 2004).

A major challenge is how to provide bicycle roads through the developed built environment of the densely populated cities that do not have any prior bicycle routes and infrastructure. This paper aims at answering this question, while deploying geographic information system (GIS) at its analysis of multilayered spatial data about the city of Izmir as being the third biggest metropolitan area in Turkey.