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# ENVIRONMENTAL PLANNING AND LOCAL KNOWLEDGE: A GEOGRAPHICAL INFORMATION SYSTEM

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## ABSTRACT

The following paper examines the possibility to manage through the Geographical Information Systems - a participatory and collaborative approach to Regional Planning environmentally oriented. The purpose is to integrate expert and non-expert knowledge at the local level. A Geographical Information system has been presented in a particular way based on commonsense knowledge that a new instrument is helpful for planning and is able to manage the new emerging paradigm of the complexity, especially in the environmental field, a domain still to explore fully. This system has double contents: on the one hand it is functional for decision- making, and on the other it contributes to give a local vision of the analysed territory. It is represented in a way that is different from the consolidated models with prevalent technical and scientific character.

The territorial contest referred to is the town of Ruvo of Puglia, situated in a wider zone -Alta Murgia - already known by the experts for its high environmental value. They are studying this area in order to transform it in a National Park

## 1. INTRODUCTION

The actual planning practice, above all in the environmental field, far from being considered a simple technical procedure able to provide universal prescriptive or behavioural rules, has developed into a variegated activity, highly sensitive to its context which takes into account the complexity in which one works where "planners work on problems with people" (Forester 1989). Therefore, attention has focused on the cognitive, communicative and participatory dimension of planning, correlated to each other notwithstanding their own specificity. In fact, the validity of a planning process relies on the necessity to lead, as much as possible, to shared outcomes which show the opinion, the beliefs and the expectations of the subjects concerned (cognitive dimension). This practice needs the involvement of the communities (participatory dimension) through different interactions (communicative - interactive dimension) aimed at pointing out different views, often in conflict.

We wonder, therefore, what could be the contribution of information technology in the actual revision of the planning process, which opportunities are to be employed and which problems are to be solved.

The present work aims at finding the way a Geographical Information System can emerge as a renewed instrument of support to planning, able represent, in a suitable way, the complexity of reality in all its, natural and social aspects.

## 2. COMMONSENSE AND INFORMAL KNOWLEDGE

The planning practice, meant as a process of "building up knowledge to apply to action", found commonsense a precious source of knowledge because of its deep understanding of the territory.

Therefore, a Geographical Information System, in order to run the new paradigm rising from complexity (above all in the environmental field, in a not entirely explored domain) is necessary to manage non-traditional knowledge forms which are the results of subjective experiences full of cultural and social meaning, of intuitions as well as personal opinions.

A cognitive framework which takes into account the numerous viewpoints of the surrounding world and is articulated on several research levels, is built on mutual learning between expert knowledge commonsense knowledge and which understands reality as unitary in spite of the diversity and the problematic nature it is made of.

The demand of dealing with informal knowledge meets, on the one hand, the necessity to find the right dialogue between the different knowledge systems, on the other the wish to represent the natural forms of reasoning which common people have about the environment they interact with.

So, both the collection of this knowledge and of other information must go beyond the traditional geometric definition which considers the map as the only means of representation.

Dealing with commonsense certainly means dealing with a high degree of complexity, far from the certain and rational scientific knowledge, often based on a well-structured theory and more or less sophisticated models.

We are, on the contrary, in the field of cognitive science where commonsense is nothing more than our personal and social history, it's the heritage of several subjective experiences.

We wonder which kind of knowledge and form of reasoning, inside the GIS, are well represented, which ones excluded and the consequences of their exclusion.

The GISs applied to planning, aimed at improving decision-making processes and at democratizing information, assume a fundamental role defined by the traditional purposes of analysis, modelling and control of environmental systems (Monno 2000), in order to reply to the necessity of building an effective knowledge for action.

In fact, the traditional representation of GIS, based on rationality, objectivity and neutrality of data, have left out geographic information, considered beliefs and subjective information such as place-based information, local knowledges, past events, historical memory of old conflicts on the use of soil.

On the other hand, however it is difficult to express the symbolic value of places for a community, their attachment to their sacredness, because GISs can easily represent single locations, while collective representations are more complex for the cultural features of knowledge systems.

Of course the risk of losing the local context in the decodification process exists and it cannot be underestimated.

However, difficulties can often be considered opportunities to elaborate pluralistic GISs able to express multiple views of the value of the resources, non-hegemonic representations of epistemologies of space, environment and territory.

### **3. COMMONSENSE AND INFORMAL KNOWLEDGE**

The use of traditional GIS, in the field of planning, is now assumed as a consolidated practice able to guarantee a high structure of the amount of data that one has (particularly in the environmental domain), allowing refined analysis, sophisticated modelling besides reliable forecasts, often included in the context of decision support systems.

This is an approach which shows the representation GIS based on the fact that there exists only one version of the reality to be shaped for which the land-use-planning or the resolution of conflict consists in a simple and more efficient solution (Pickles 1999).

It is as if revival of rational planning procedures and an extreme faith in the objective nature of data and facts able to speak for themselves had been renewed (Ocelli-Rabino 1999).

On the other hand, the planning practice seems slowly to evolve towards a pluralist process of information exchanges where decisions are based on shared knowledge. This knowledge is born of mutual learning, and the representation of the context is reached by means of everybody's consent (Marinelli 1999).

In this context, GISs might be interpreted as true means of communication (rather than a support to the decision) and a challenge is suggested for them: to be useful tools for the research of significant information because of their ability to use and complete a great quantity of data (Monno 2000).

In such a process, the various actors should not assume predetermined roles but favour a true

dialogue and a process of mutual learning.

It is clear that if an Information System can assume this important role in communication, it becomes fundamental to understand the nature of interaction of communities with GISs, and how these can have an approach physically. An approach of local character can also favour a physical interaction among the members of the community (which could be reinforced) while a virtual approach (Web Network Information) allows more flexible participation, quicker exchanges and a wider diffusion of local resources.

Certainly, the use of the system can be of different degrees and depending on manifold factors: organization level offered by the community, planning agency, individual capability of the user.

One can also proceed from a passive and indirect use through maps, databases and standard procedures to an active one where the user is free to develop his own operations and classifications and the use of his own data autonomously.

The communicative process will be enhanced where the user is collaborative, no longer individual, making collective negotiations and decisional processes easier.

It is a complicated process which requires a good organization structure and it will really prove democratic only when the systems evolve more and more into user-friendly approaches which consent direct participation.

## **4. CASE OF STUDY**

### **4.1. Identification of the problem**

The purpose of this case of study is to make a Geographical Information System that represents informal and commonsense knowledge.

The interaction with the community has a gender approach in order to discover the role of the women in a local area. Particular attention is given to the role of the women in the domestic economy where their presence is higher.

The aim is to valorise the exigencies of a sustainable development in a particular way in a territory where one of the primary purposes is environmental protection.

It is useful to remember that the territorial contest referred to is located in a wider zone known by the experts for its high environmental value and for this reason it is essential to investigate the communities' perception on living there.

This is an irreplaceable element to make a complete cognitive scheme and at the same time it is decisive for future action realisable with the local population.

The objective is to valorise places like as they are seen by local communities, identifying the practice of use and transformation, the problematic and conflict domains and finally the descriptive capacities of the same places. It is known that the information analysed for most of the cases, are not associate to traditional metrics. Usually the information is different from the substantial and formal point of view.

The problem is not to find information in the 'village' but to organise them in a useful way for our objective that allows us to identify the problems easily and then to find a good solution to solve them. It should be noted that the criteria used to organise the information is not absolute (Jordan 1998) but they are useful for our analysis.

The objective is to be able to represent the situations according to fixed rules, which should be shared. The only way to accept them is a correct interpretation that is able to add value to the data collected and to transform them into knowledge.

Furthermore, the possibility to govern a territory is in a strict relationship with the available knowledge. It is important to understand how these 'spontaneous' cognitive agents contribute to this knowledge and how they can interact in a Geographic Information System among them or with 'expert' cognitive agents.

It is necessary to research the possibility to compare the expert knowledge and the experiential knowledge through a virtuous process of cooperation that gives a series of communication problems. These problems are not easy to solve for two reasons. The first is due to the difficult linkages between linguistic protocols of the communities and geographic protocols (these mean a representation of the territorial reality). The second reason is the different value given to the representation of people involved with different functions in the process of the construction of the knowledge. As a consequence of that the interactions are as interesting as problematic.

In fact the thoughts of a communicative action are prevalent as they are always random and without systematic frequency. This is difficult and should be added to the problems concerning the 'multiple' agents. These are characterised by a cognitive blank and this condition may be a point of weakness for the model of development thought.

From this point of view the GIS can represent a double functionality, one can be defined as a centralised character used in the process to make decisions and the other 'distributed' used to give representations of the territory that is able to make different worlds turn around it.

These are configured like 'possible worlds', which represent ambitions, hopes and desires of modification of reality and they affect the perception of space and its shape is the result of a perceptive activity with a background of beliefs (Maciocco, Tagliagambe (1998).

My plan is to build a GIS in order to be able to collect and to process informal data of qualitative characters, which come from common knowledge. There are two orders of problems; the first concerns research of the data and this is detailed in the following paragraph, the second is strictly connected with the knowledge of a numeric system without losing the character of complexity.

#### **4.2. Practice of listening and decoding of the verbal protocols.**

The program of listening for the acquisition of the commonsense knowledge of inquired territory is divided in different steps. There was a preliminary phase that consists of an investigation with the purpose of understanding the local situation of women in Ruvo. The fields of interest are social and economic aspects and the relationships which women have with the territory and with environmental problems.

The second step was to interview the women, who live in the 'murgian' territory for part of the year.

In the preliminary phase there were meetings in Ruvo with the institutions and in particular with the mayor and with a municipal clerk responsible for social politics, with the representatives of the environmental clubs, with a historian and finally with an expert of the territory. Moreover, an informal investigation was carried out with trade associations where it was discovered that the traditional activity of women was dress-making and at the same time nothing was about agriculture.

The following steps, which took place on site, were carried out as semistructured interviews, according to a plan of research corresponding as much as possible to the framework of the context. In this way the women interviewed could express their opinions freely, without being influenced by a set of predetermined categories.

We went on to decodify the verbal protocols of the first consultation, which took place by writing some file-cards. In them there are some complex describers, taken from the narratives, which contain different pieces of information, completed by the words (written in italics) of the same women.

Some of the describers have a socio-economical meaning; they tend both to determine the characteristics of the firm, its history, transformation of activities and short and medium time plans, and to specify the role of workers within the firm itself.

Other describers specifically look into the description of the territory according to different parameters such as: the physical description, the most common customs, the love for it, its problem and all the initiatives to make it known abroad.

The general outline, already anticipated in a preliminary phase, has shown a difference between Ruvo's women and those of the neighbouring little towns. The first ones are less engaged and more detached in farm and livestock activities. This difference disappears in agritouristic activities of which the

women seem to be the real promoters.

Another clear element is linked to the relationship that these women have with the territory, according to the generation they belong to and their working activities. In fact, if the older women show their love for the area called "Murgia", that is considered as their living surroundings (sometimes it is also experienced as a constraint), the younger ones seem to have a greater consciousness of the place considered easier than in the past, comparing it, more or less, to the life in town.

Both groups of women give the same value to the places concerning the more frequent habits and their present and potential productivity. Moreover conflictual elements emerge, concerning above all the transformation of the soil (particularly freeing it by taking out the rocks) and the possibility to avail themselves of more modern structures supporting agricultural and zootechnical activities.

As to the transformation of the soil there is a contrast with the Institutions that do not agree with it. This is often due to a different vision of the problems among the people involved: some of them think it is necessary to preserve the characteristics of the landscape completely; others, on the contrary, favour seed single-crop system - at the moment more profitable than other agricultural policies.

After this first phase of listening and decodification of the verbal protocols, moving towards the construction of the information system, we realized that there were some difficulties due, above all, to the geographic reference information that in many cases turned out to be impracticable. This was in part due to the generality of the themes faced in the first interview and in part due to the typology and scale of the cartographic support utilized. A second phase of listening followed that intended to treat the relation with the places in a more pacific way, giving particular attention to their location and meaning, with a very fine enquiry. Meanwhile, an opportunity was taken for a first verification of the modality of the interpretation of the knowledge acquired before. In this second case the reference support consisted of the AIMA orthophotos in scale 1:10.000.

The decoding process of interviews, therefore, made further forms possible, among which I identified different typologies of places, both in connection with their function (Recreation Place, Activities Places) and according to the familiar vision ascribed to them (Places in Ranger, Places to Improve, Unusual Places, Places for Community).

Finally on the basis of the close connection between the attribution of value to the places and the recognition of resources, I tried to identify the latter (naturalness, rareness, specificity, vulnerability, affection, use, productivity) in order to make the processes followed by interviewed subjects more definite.

#### **4.3. The structure of the system**

In the phase of construction of the Geographical Information System, the first matching difficulty was, to a certain extent, to give account for the complexity of the established cognitive scheme, according to a reciprocal exchange process among different information levels which, going through data, information and knowledge, in the broadest sense of the word, can express the local background properly.

In this case the conventional geographical world studied and represented with objective method contrasts with the perception of that world (from individual cognitive agents) that takes on subjective experience and contradictions, not always easily represented.

Thus, the use of cognitive maps seemed fundamental in order to interpret these sorts of processes, which joining the graphic description (with some hotlinks activation) allowed the system a conceptual autonomy of its own. Moreover, following some hyper textual connections within these maps, it is possible to choose different close examination courses leading, through the words of the women interviewed, to understand some subject matters thoroughly, and to go into details of some descriptions.

Thus, in the choosing of the system structure I have tried to make clear the conceptual course of the cognitive agents and of their vision of the territory, just as is showed in the whole cognitive map. In this connection you can see, as far as perceiving the whole territorial reference context, an important role is given to the dynamics within it. Indeed, nearly always, every description takes into consideration the executed processes of transformation, both at farm and territorial level.

The former are in close connection not only with the problems of local characteristic but also with global policies, mainly at a communitarian level. The latter, on the contrary, are perceived as transformation and decay of the landscape, according to a shared view, regarding the presence of quarries or high fire hazard in conflict about the costum of taking out rocks.

The development of the farm activities, however, on one hand is induced by demands of production and, sometimes by the acknowledgement of the particular value assignable to the places; on the other hand, it appears to be the cause of transformation of the territory, both directly and through the making of short and middle term projects.

The value of the places entertains a biunivoc correspondence with the finding of the territory resources, whether more or less sustainable.

The proposed integration between cognitive maps and Geographical Information Systems sometimes contributes to lessen the traditional deformation existing among conceptual aspects bound to commonsense knowledge and the visualization in a given reference system. Yet, there are aspects that are doomed to be unresolved, mostly those linked to the representation, however set up on isotropic space, as the geometric-euclidean one is.

Particularly problematic, as a matter of facts, appears the change to express a stratification of means which would be typical of common knowledge and of the representation of communities, not easy to identify by univocal definition. This is a consequence of the comparison made by means, originally designed to portray single locations, associated with particular data or information, which traditionally set up expert and, most of all, technical-scientific knowledge.

This happens, for example, to the woods that receive varieties of meaning, with regard to the practice concentrated in it, to the environmental value assigned to it and, generally, to the connection arranged by the agents with this place.

So we can understand how the executed system containing lots of information, aims to give a reason for this greater density of meaning which is peculiar to informal knowledge.

I tried have to represent the structure of women's spatial reference, of multiscalar nature, which discloses through multilevel views, in some cases, connected with the whole territory, or connected with the farm dimension, or connected with the exact dimension of an unusual place.

Thus, to give a reason for this multiscalarity the first description sees the whole territory of reference, according to a pattern which through principles tied with the altimetry and the presence of different cultivations, locates a region perceived as truly *murgiana*, an intermediate region and an urban region, with some areas of transition, in conformity with a logic that sees the transition through the different regions of soft nature.

Compared with technicians, afterwards, I noticed a certain coincidence with this view, indeed the region identified as intermediate, for example, would represent an old almond grove of high environmental value.

Also the views of territorial transformations and resource belong to the same reference context, even if less wide towards the urban region, where the transformations of the activities and the specific places are mainly restricted to the farm boundaries. Actually, it was quite hard to establish the territorial context reference as the extent of locations of the different processes and problems do not look clear compared with the range of action of individual agents. In any case, I chose to represent the farm boundaries rather than the administrative ones as they are 'perceived' more than the latter ones, even if, all things considered, it is not possible to establish definitely the territory these women had in mind.

Moreover, I tried to represent the several situations of environmental decay, showing the unsafe regions. These make up the regions subject to the practice of taking out rocks, as well as to quarries and regions crossed by fires.

Finally, I distinguished the causes of decay shared by the whole community (quarries and fires) from the conflicting ones (taking out rocks), expressing through cognitive maps the nature of the existing conflict.

So I needed to use uncertain, indefinite and partial data which give greater space to a process of interpretation, realizing that it constitutes a filter to the representation of the views under examination.

## 5. CONCLUSIONS

Through the testing carried out, we get high-added value of a territorial information system with a basis of acquaintance set up on the common knowledge of local subjects, whose meaning is both of an individual, social and cultural nature.

Firstly, the importance of the acquisitive phase of the cognitive scheme, whose difficulties are mostly due to the decoding and interpreting of verbal records is stressed, and they are also very different from the problems of the quality of data, typical of traditional GIS, as pursuit of accuracy, precision, substance and completeness.

In a prevailing cognitive domain, in fact, bearing uncertainty, vagueness, ambiguity and conflict are far removed from the claim of these requisites - a circumstance which is on one hand problematic, and on the other hand extremely rich as it expresses greater complexity.

The course accomplished up to now, however, cannot be considered exhaustive at all, as it is linked to a convalidation of the system, for instance, by the accomplishment of a meeting of communities, aiming at verifying single visions of the territory and producing, if need be, some other views.

The chance of a comparison with an expert knowledge is also hoped in order to integrate the two "information layers" and give rise to a better understanding of the territorial reality in its varied aspects.

## REFERENCES

- Buckingham S., Evans B. (1996), "Achieving sustainability through environmental planning", in Buckingham S., Evans B. (Eds.), *Environmental Planning and Sustainability*, Chichester, John Wiley and Sons.
- Borri D. Barbanente A., Khakee, A. (2000), "Expert and experiential knowledge in planning", *Journal of Operational Research Society*, 51, pp.776-788.
- Campari I. (1996), "Modellizzazioni dello spazio realistico: I contesti urbani", in Maciocco G., *La Città in Ombra*, Milano, FrancoAngeli.
- Esnard A. (1998), "Cities, GIS and ethics", *Journal of Urban Technology*, 5 (3), pp. 33-45.
- Forester J. (1989), *Planning in the Face of Power*, UCL, Los Angeles.
- Harcourt W. (1994), "Negotiating positions in the sustainable development debate: Situating the feminist perspective", in Harcourt W., *Feminist Perspective on Sustainable Development*, London, Zed Books.
- Harris T., Weiner D. (1998), "Community Integrated GIS for land reform in Mupalanga province, South Africa", <http://www.ncgia.ucsb.edu/varenius/ppgis/papers/>.
- Häuler S. (1994), "Women and politics of sustainable development", in Harcourt W., *Feminist Perspective on Sustainable Development*, London, Zed Books.
- Istituto Nazionale di Economia Agraria (1999a), *Le Misure Agroambientali in Italia. Analisi e Valutazione del Reg. CEE 2078/92 nel Quadriennio 1994-1997. Rapporto Nazionale*, Roma, Lithoteam.
- Istituto Nazionale di Economia Agraria (1999b), *Le Misure Agroambientali in Italia. Analisi e Valutazione del Reg. CEE 2078/92 nel Quadriennio 1994-1997. Rapporto Regionale*, Roma, Lithoteam.
- Iyer-Raniga U., Treloar G. (2000), "A context for participation in sustainable development", *Environmental Management*, 26, pp. 349-361.
- Leitner H. et al. (1998), "Models for making GIS available to community organizations: Dimension of differences and appropriateness". Paper presented to the *NCGIA specialist meeting on Empowerment, Marginalization and GIS*, Santa Barbara (CA), October 1998.
- Jordan G. (1998), *A Public Participation GIS for Community Forestry Users Group in Nepal: Putting People before the Technology*.  
<http://www.ncgia.ucsb.edu/varenius/ppgis/papers/>.
- Kitchen L. (1999), "Environmental policy and the differentiation of rural space: An actor-network perspective" *Journal of Environmental Policy & Planning*, 2, pp. 135-147.
- Kraak M.J. (1999), "Visualizing spatial distribution", in Longley P., Goodchild M.F., Maguire D.J., Rhind D.W., *Geographical Information System*, Chichester, John Wiley & Sons, vol. I, pp. 157-173.
- Maciocco G., Tagliagambe S. (1998), *Ritorno ad Itaca*, Bari, Dedalo.

- Mark D. (1997), "Cognitive perspective and spatio-temporal reasoning", in Craglia M., Coucleis H., *Geographic Information Research Briding the Atlantic*, London, Taylor and Francis, pp. 308-319.
- Mark D., Friendschuh S.M. (1995), "Spatial concepts and cognitive models for geographic information use", in Nyerges T.L., Mark D.M., Egenhofer M., *Aspect of Human-Computer Interaction for Geographic Information System*, Dordrecht, Kluwer Academic Publisher, pp. 21-28.
- Mark D., Egenhofer M.J., Hornsby K. (1996), "Formal models of commonsense geographic worlds", *Report on the Specialist Meeting of Research Initiative 21*, October 30 November 3.
- Mellor M. (1996), "Sustainability: A feminist approach", in Buckingham S., Evans B. (Eds.), *Environmental Planning and Sustainability*, Chichester, John Wiley and Sons.
- Monno V., Concilio G., Grassini L. (2000), "Planning in developing countries: A DSS approach for managing the water resources in the Lushnje district, Albania", *Interdependency between Agriculture and Urbanization: Conflicts on Sustainable Use of Soil and Water*, Paris, CIHEAM Option Méditerranéennes, 44, pp.71-92.
- Nijkamp P., Scholten H. (1999), "Nuovi strumenti interattivi di pianificazione per l'uso sostenibile del suolo", *Urbanistica*, 112, pp.176-180.
- Ocelli S., Rabino G. (1999), "Razionalità e creatività nella modellistica urbana. La disciplina dei nuovi modelli urbani operativi", *Conferenza Nazionale su Informatica e Pianificazione Urbana e Territoriale (Input 99)*, Venezia, June 9-11, 1999.
- Palerm J. (2000), "An empirical-theoretical analysis framework for public participation". *Journal of Environmental Planning and Management*, 43 (5), pp. 581-600.
- Pickles P. (1999), "Arguments, debates and dialogues: The GIS social-theory debate and the concern for alternatives", in Longley P., Goodchild M.F., Maguire D.J., Rhind D.W., *Geographical Information System*, Chichester, John Wiley & Sons, vol. I, pp. 49-60.
- Pittaluga P. (1998), *Immagini Spaziali delle Società Locali e Requisiti del Piano*, PhD thesis, Roma, Università degli Studi "La Sapienza".
- Portugali J. (1996), *The Construction of Cognitive Map*, Dordrecht, Kluwer Academic Publisher.
- Roseland M. (2000), "Sustainable community development: Integrating environmental, economic, and social objectives". *Progress in Planning*, 54, pp. 73-132.
- Rubenstein B., Montano F. (2000), "A survey of knowledge-based information system for urban planning: Moving toward knowledge management", *Computers, Environment and Urban System*, 24, pp. 155-172.
- Worboys M.F. (1999), "Relational databases and beyond", in Longley P., Goodchild M.F., Maguire D.J., Rhind D.W., *Geographical Information System*, Chichester, John Wiley & Sons, vol. I, pp. 373-384.