FIELD METHODOLOGIES AND COMMUNITY MAPPING SYSTEMS
FOR ENVIRONMENTAL COOPERATION IN AFRICA
Session V

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ABSTRACT

Conservation actions related to sustainable development in Africa need a deep reflection on the role of territorial organization of local societies with the aim, on the one hand, to recover the dynamics of traditional legitimacy, and on the other, to present operational instruments that cooperation institutions can use for realizing a real territorial legalization of local communities organization.

The paper focuses on the SIGAP Strategy (*Geographic Information Systems for Protected Areas*), a research methodology created by the team of geographers of the University of Bergamo within the *Diathesis* Cartographic Lab and it has already been applied in environmental conservation projects in some sub-Saharan African countries. This methodology supports the realization of participatory management plans for protected areas peripheries, following three objectives: a) to recover the territorial organization and territorial values of local people as a platform for managing a protected area buffer zone; b) to communicate these values by the use of a multi-scale participatory cartography to be used in negotiation tables; c) to build instruments of capitalization and decision support systems.

The SIGAP Strategy has been tested in Western Africa within two protected areas of the WAP Complex: the W Transboundary Biosphere Reserve (WTBR, Benin, Burkina Faso, Niger, 2001-2005) and the Arly Unity of Protection and Conservation (Arly UPC, Burkina Faso, 2006-2009). In the first case, the research has been developed within the *Programme Régional Parc W/ECOPAS-UE*, whose objective was the definition of the park buffer zone and transition area following the UNESCO's MAB program. In this context, the group of the University of Bergamo has created a project of university cooperation with the geographers of the universities of Ougadougou, Niamey, Cotonou. In the second case, the research has been realized within an interuniversity cooperation program with the 2iE (*Institut International de l´Eau et de l´Environnement*) of Ouagadougou aimed at an analysis for the study of the socio-territorial organization and landscape values of the peripheries of the Arly Unity of Protection and Conservation.

Through the analysis of case studies, we show the functioning of this methodology in its different modular phases that create specific operational instruments identifying in community mapping an important instrument for environmental planning: i. field research, for a territorial diagnostic; ii. data modeling for producing their cartographic representation; iii. strategies for creating participation, by respecting local communities logics and different actors; iv. capitalization and promotion of the results obtained during the research.

INTRODUCTION

The present study advocates a strategy aimed at implementing the principles of sustainable development through operational tools to be used in programs for environmental conservation. To be more precise, we lay out a proposal of a participatory methodology, the SIGAP Strategy, that is innovative in two main respects: i) it is based on an assessment of the territorial setup and the social values of the peoples who inhabit the parks buffer zones; ii) it is represented through customized GIS cartography.

As a matter of fact, cartography and field research have been seen as two complementary phases which provide both theoretical reflection and practical application when ordinary criteria in the zoning of park peripheries are challenged. The new zoning criteria rely on the recovery of the territorial perception of local communities whose consensus on plans for environmental conservation is thus ensured. In sum, we advocate a zoning model that may prevent conflict between local communities and international agents while also promoting development of the former.

This methodology is the result of new theoretical approaches that show how a given territory may be used together with its local systems of representation in order to examine and understand the functioning of a social group [1]. Yet this model is not merely theoretical, for its pragmatic value has been demonstrated during field research within the ECOPAS program in a specific territorial context - the peripheries of W Transboundary Biosphere Reserve (Benin, Niger, Burkina Faso) - and also within the peripheries of the Arly Unity of Protection and Conservation (Arly UPC Burkina Faso), where it has proven effective.

COMMUNITY MAPPING AND COOPERATION

Mapping became one of the participatory methodologies (PM) during the eighties, some years after the development and spread of so-called subjective mapping, which refers to the representation of the thoughts of the subject, so-called mental or cognitive maps [2]. Only later, mapping was used in territorial projects and refers to the representation of the territory by a community of parties (in England, *parish maps* were born) [3]. In developing countries, participatory mapping has spread, under the different names *participatory maps*, *community maps* [4] and became one of the tools used by agencies, NGOs, and local bodies during field research aimed at promoting development projects through involving rural communities in southern areas of the world. From then on, it

has taken a variety of roles and forms, becoming the most common of the PM tools.

Participatory mapping has entered into the range of investigative tools (transects, calendars, quantification tools, Venn diagrams, conflict matrices, role play, type analyses), giving it a specific purpose: the collection of territorial reference information, above all during the initial phases of research, which aims to supply an overview of the area under study, the natural resources, and the infrastructure present.

Towards the end of the eighties, with the rise of geographical Information systems (including GIS and GPS) together with the optimisation of remote aerial and satellite techniques, mapping took on a new role within development cooperation projects. There are now community mapping systems which include both hand drawn maps as well as those produced using digital technology.

Although the intended role of participatory mapping systems is to highlight the logic behind a little known area and to focus territorial research on in-depth analysis of social reproduction mechanisms, the researchers who ask the communities to produce maps inhibit their potential by re-processing them using parameters which are strongly connected to western cultural models, without taking into account their communicative results.

During the course of the years, the rise in popularity of this tool has been shown by a collection of works largely concerning the technical aspects related to its implementation, yet little attention has been given to the communicative results and the significance that this mapping tool has for decision making policies. Robert Chambers, the accepted reference point for participatory methodologies, considers only the method used and the subject represented to propose a classification of maps [5] similar to other authors, who, to illustrate the role of participatory mapping in cooperation and development, focus exclusively on the tools used for its production [6].

During the nineties, the addition of Geographical IT to participatory methodologies started a debate on the social implications of the use of such technology in territorial planning projects. Various authors have previously stated the need for an epistemological change in the interpretation of the map [7], offering some theoretical hints which have influenced discussion within cartography and were developed within the context of the American project *Initiative 19 – GIS and society.*

In this context, some American geographers expressed doubts over the capacity of cartographic technologies to incorporate conceptualization carried out by local communities for their local areas, as this is "geographically imprecise cognitive information which is not easily expressed through the paradigm of point/line/polygon/pixel of GIS" [8]. To these, others have been added according to whom GIS technology in inter-cultural dialogue has geo-political implications because "[...] it is an epistemological assimilation tool and, therefore, the most recent of the series of attempts made by western society to subordinate indigenous cultures" [9].

With the publication in 1995 in the USA of the noted work of John Pickles *Ground Truth: the social implications of Geographic Information Systems*, discussion passed from a purely theoretical critique to an experimental one, substantiated by case studies and applications which demonstrate two aspects: the first, regarding the figure of the cartographer, that is the possibility of allowing the use of geographic information systems also by local communities; and the second, concerning the process of construction of

cartographic information: the possibility of representing local knowledge through the use of new cartographic technologies. In the first case, the intention is to make the local community autonomous in the management of technology and data collection, in the second case, the goal is to find the applications most suitable to restore knowledge and cultural values, such as those which are symbolic and related to myth, which are not usually considered by the broad range of graphical tools offered by GIS. While attempting to overcome the contrast (defined as "GIS-empowerment-marginalisation-nexus") between the two approaches which see in technology the simultaneous combination of two capacities for reinforcement or marginalization of local communities, some authors proposed a reconsideration of cartographic technology as systems which, if used in a thoughtful manner, are able to facilitate communication between subjects characterized by different cognitive processes and cultures. In reality, the question is not the ability to capture and reproduce all local knowledge, but it is to select and represent the same in a relevant manner (Engle, 2001: 30). Furthermore, it is possible to imagine thoughtful mapping which, in line with the principles of participation and environmental governance, tries to restore the social sense of places and, therefore, the identity of those living in the area represented (Casti, 2006: 977).

Figure 1 – Community mapping in the village of Monko (Benin)

This lead to the creation of so-called participatory geographical information systems, which were also included within development projects, allowing the geo-reference and display of territorial knowledge of local communities, known in the English speaking world by the acronym ISK – Indigenous Spatial Knowledge [10]. These systems use GIS software for the analysis of complex data banks; from geo-referenced orthophotos, useful in reconstructing with local communities the different uses of the land in large areas; to GPS systems to establish traditional village boundaries, or zones contested by several parties, or to geo-reference some traditional elements shown in community maps.

THE SIGAP STRATEGY: FIELD RESEARCH AND CARTOGRAPHY

The SIGAP Strategy is a research methodology created by the team of geographers of the University of Bergamo within the *Diathesis* Cartographic Lab (www.unibg.it/geografia). It

offers an answer to the difficulty of identifying methods and instruments able to translate the principles of sustainability and participation, by using GIS systems and technologies (*Geographic Information Systems*) respecting the social-territorial organization of local communities and the objectives of International organizations (UNESCO, IUCN, UE). It assumes the knowledge of local territorial organization as an element for giving instructions for co-management and for identifying the different involved actors. During field research, the SIGAP Strategy sees territory as the result of a dynamic interaction between the natural environment and the peoples who inhabit it. One cannot fail to consider this if one admits that the notion of territory does not merely convey the material conditions of the humans who settle there but also embodies symbolic, cultural and communal values on which the functioning of a given society depends. This is all the more relevant in specific contexts, such as the African one, where black settlements along the peripheries of parks, removed as they are from urban areas, are still largely based on a traditional system of cosmogonic rules bearing primarily upon territory and the rights to own land, to hunt, or to farm. Hence the need to carry out field research in ways that may effectively account for such complex variables rather than focus exclusively on the set of material data which cartographic reconstruction ordinarily employs.

This Strategy has already been applied in environmental conservation projects in s supports the realization of participatory management plans for protected areas peripheries, following three objectives:

a) recover the territorial organization and territorial values of local people as a platform for managing a protected area buffer zone;

b) communicate these values by the use of a multi-scale participatory cartography to be used in negotiation tables;

c) build instruments of capitalization and decision support systems. ome sub-Saharan African countries.

This methodology has been tested in Western Africa within two protected areas of the WAP Complex: the W Transboundary Biosphere Reserve (WTBR, Benin, Burkina Faso, Niger, 2001-2005) [11] and the Arly Unity of Protection and Conservation (Arly UPC, Burkina Faso, 2006-2009) [12]. In the first case, the research has been developed within the *Programme Régional Parc W/ECOPAS-UE*, whose objective was the definition of the park buffer zone and transition area following the UNESCO's MAB program. In this context, the group of the University of Bergamo has created a project of university cooperation with the geographers of the universities of Ougadougou, Niamey, Cotonou. In the second case, the research has been realized within an interuniversity cooperation program with the 2iE (*Institut International de l´Eau et de l´Environnement*) of Ouagadougou aimed at an analysis for the study of the socio-territorial organization and landscape values of the peripheries of the Arly Unity of Protection and Conservation.

THE CASE OF WESTERN AFRICA PROTECTED AREAS

The SIGAP Strategy has been tested in Western Africa within two protected areas of the WAP Complex: the W Transboundary Biosphere Reserve (WTBR, Benin, Burkina Faso, Niger, 2001-2005) and the Arly Unity of Protection and Conservation (Arly UPC, Burkina Faso, 2006-2009) (Figure 2).
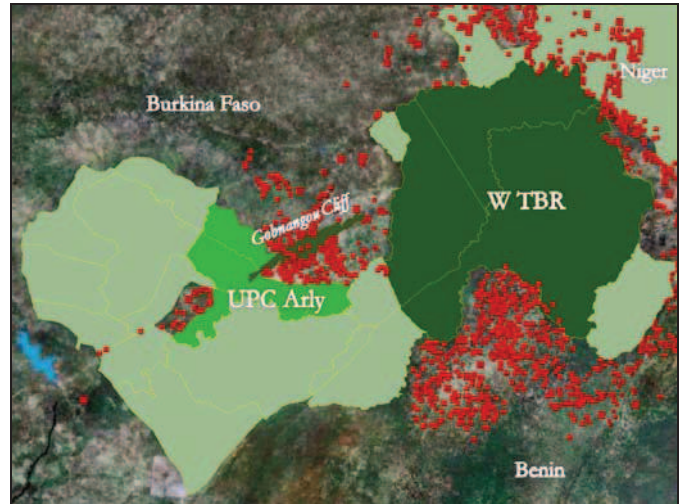

Figure 2 – The area of application of the SIGAP Strategy in Western Africa

In the first case, the research has been developed within the *Programme Régional Parc W/ECOPAS-UE*, whose objective was the definition of the park buffer zone and transition area following the UNESCO's MAB program. In this context, the group of the University of Bergamo has created a project of university cooperation with the geographers of the universities of Ougadougou, Niamey, Cotonou. In the second case, the research has been realized within an interuniversity cooperation program with the 2iE (*Institut International de l´Eau et de l´Environnement*) of Ouagadougou aimed at an analysis for the study of the socio-territorial organization and landscape values of the peripheries of the Arly Unity of Protection and Conservation. The research experience developed within the SIGAP Strategy is strongly anchored to cartography. The aim is to recover the identity and the communal values of African peoples through a socio-territorial analysis aimed at laying out a cartography of peripheries of extensive conservation area. In the course of our research we found that in order to produce a reflexive cartography with regard to the social value of territory we needed to invest heavily in each of the research phases. Namely:

- it was crucial that information on the social meaning of territory should appear on the map;
- such information had to be symbolically encoded in ways that reclaimed the social values of the people who inhabited that territory;
- the map must convey the socio-territorial setup by featuring its social practices;
- in order to achieve cumulative data integration, it was necessary to work at both scales (regional and local);
- the adoption of the map in planning must account for the results of cartographic communication as highlighted through semiotic studies (self-reference and iconization).

The field research was conducted between 2001 and 2009 during drought seasons by a mixed team of researchers from Northern and Southern institutions (University of Bergamo, Italy; University of Cotonou, Benin; University of Niamey, Niger; University of Ouagadougou, Burkina Faso; 2iE, Ouagadougou, Burkina Faso) who had previously been trained in the methods and theory to be used in research. Since the pieces of information to be collected must reflect social practices, they were necessarily recovered by direct observation of the territory and later collated within a

thorough socio-territorial inquiry. Top priority was thus given to the recovery of basic issues and to an understanding of the symbolic values which underlie traditional communities. So we can describe the SIGAP Strategy as a four modules methodology, based on four steps (Figure 3).
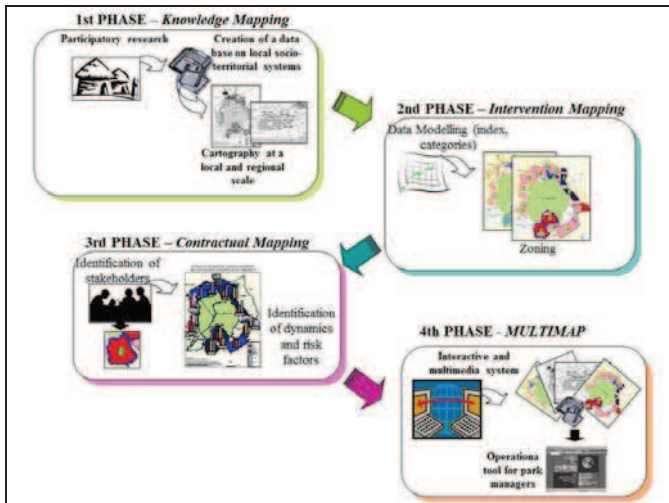

Figure 3 – The four steps of the SIGAP Strategy

First of all, collected data processed via GIS software and yielded a cartographic representation in terms of ***knowledge-based maps*** on two different scales: regional and local. At the regional scale, specific knowledge coming from inhabitants and general knowledge of socio-territorial systems at the regional level were put together. Also, Western-based criteria (number of villages, population density, ongoing dynamics, ..) were matched with African categories, which ultimately allowed for a translation and a revaluation of the basic values underlying territory.

Regional maps served primarily to encode quantitative and qualitative data which gave us a measure of the dynamics at work in the areas analyzed and of the social phenomena that bring about change or ensure stability. Information thereby produced yielded a representation of the socio-territorial layout at the peripheries of the Park, and served, above all, to highlight change factors and to suggest plans and modes of intervention (Figure 4).
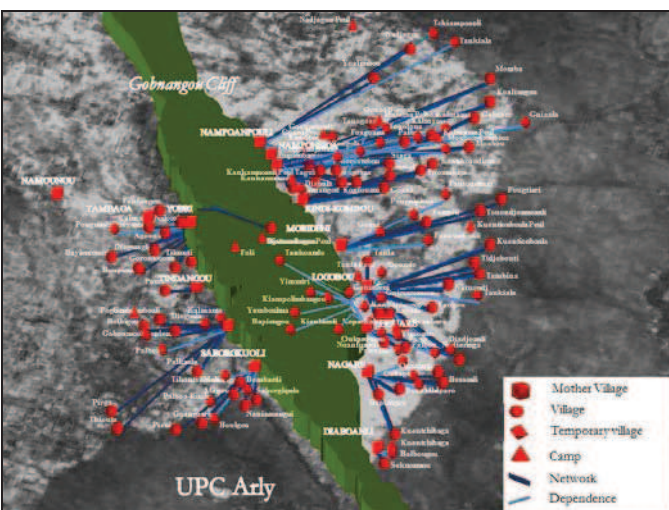

Figure 4 – Example of regional map that recovers the traditional setup of the villages of the Arly UPC (Burkina Faso)

If we now turn to the other side of cartographic research, the participatory one, carried out in the same context on a local scale, we must keep in mind that it involved local people, actively called upon in the researching of communal practices: this has established a common ground for a discussion of the measures for environmental conservation between the involved parties. What we did in this case was to approach the community map in ways that could bring out new, relevant pieces of information. For community maps are not invariably and purposefully used in planning and in cooperation: their communicative clues are often neglected in practice, instead of being used to voice the issues of populations who inhabit the Southern hemisphere. As a matter of fact, the mere adoption of a community map as a data-gathering tool does not ensure a true reassessment of the social values rooted in territory. Conversely, an analysis of the semiotic potential of participatory maps shows how they can be used effectively to make sense of the knowledge shared by local communities [13]. Community maps have proven particularly effective in the research field of environmental conservation, where they provide key information on the relationship between local settlements and their environment by shedding light on conventional practices of conservation and resource exploitation as conveyed in the symbolic values local inhabitants employ. What we kept in mind in our experience was essentially the evidence provided by cartographical semiosis, i.e. the fact that the esthetic layout of a map may equally well turn out to be an aid or a hindrance, all the more so when we are dealing concurrently with different cultural contexts. Our participatory maps were processed by using the language of analogy which - by virtue of its reliance on perceptual experience - has proven easier to understand (Figure 5). To be sure, the readability of a map does not
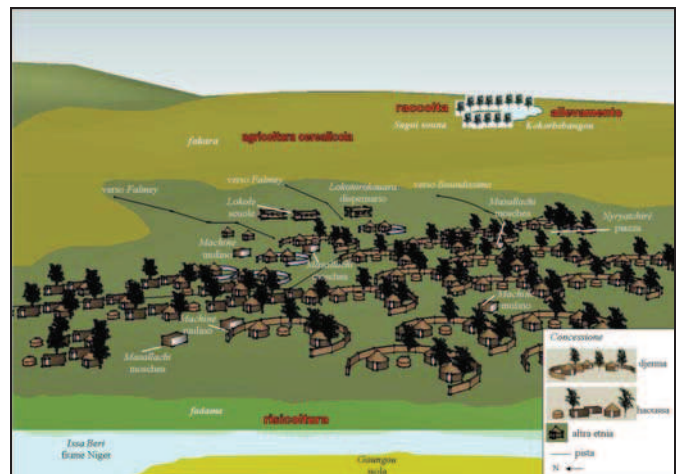

Figure 5 – Example of community map at the local scale: the village of Bossia in the periphery of the W TBR (Niger)

depend exclusively on its allowance for perceptual experience, but also on the proficiency local agents are granted in gathering socio-territorial information and in interpreting it on the connotative, social level. Once again cartographical semiosis comes to the rescue in extracting and expressing features of maps that would otherwise have lain hidden; features which later helped to substantiate claims and corroborate knowledge as conservation was planned. In communicative terms, the tool of cartographical representation proved surprisingly effective at the very outset of research, as it helped researchers to give shape and sense to a plethora of collected data. Documentation thus produced was later used to come up with plan cartography which proved unpredictably useful in participatory development programs. Our first attempt in this phase was to use cartography as an

information-generating tool to supplement field-research data. On a regional scale, the map allows for comparative analysis of the kind that would have been virtually impossible by relying only on endless lists of itemized data. On a local scale, the map highlights community values and knowledge items which conventional methods of inquiry would have neglected. At the planning stage, interpretation of the new data collected by this cartography made it possible to formulate predictive assumptions as to the effectiveness of our research model and its conservation project.

At a later stage, which could be defined as the phase of **intervention**, we used previous results to conceive and set up
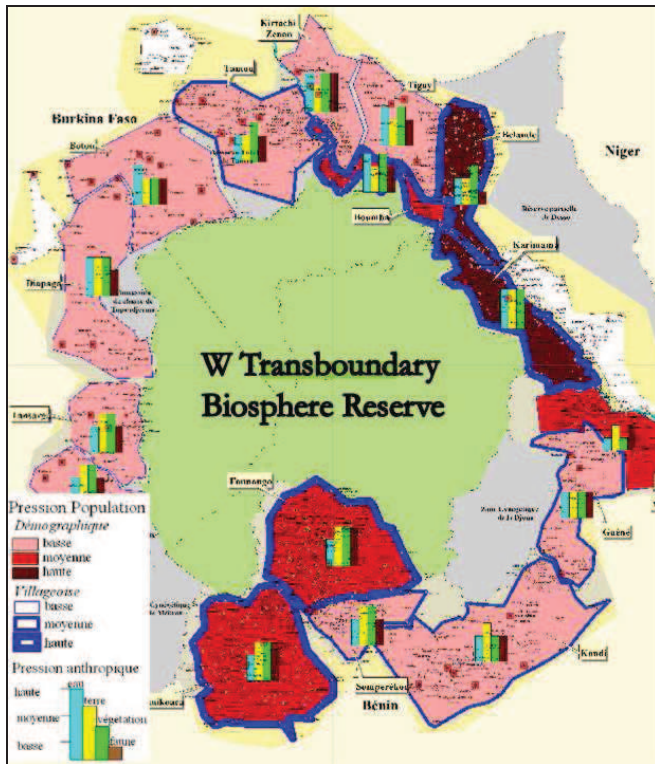

Figure 6 – Pressure of zoning sectors in the periphery of the W Transboundary Biosphere Reserve

a model of participatory zoning for the peripheries of W Park. This model is based on three main criteria: *cohesion*, which examines the extent to which territory is homogeneous to make sure that the conservation project matches local issues; *pressure,* which takes into account the extent of human intervention on the natural resources to be preserved and gives us a measure of the urgency and priority of conservation planning; and lastly *localization*, which looks at how close or how distant human settlements are with respect to the Park limits in order to come up with an index of anthropic persistence within the research area. These criteria were used to lay out three different zones: *first-level units*, established on the basis of socio-territorial cohesion; second-level units, or *sectors*, defined on account of the cohesion or pressure exerted on natural resources; and a *localizing frame,* which depends on the distance of settlements from the park and the protected areas. The final zoning map was obtained by integrating these three zones types (Figure 6).

The third research phase could be named **contractual**. It is the pragmatic phase of co- management, where a zoning map - aimed at providing a practical management tool - is produced. We proposed an innovative type of management based on the joined results of cartography and field research; a management which effectively boosted negotiation between the parties involved by making them aware of cartographical

dynamics. Identity values, on the basis of which local communities establish their territorial setup, are thus used to devise a new model of participatory zoning on the peripheries of the protected area. Far from being merely a theoretical instrument, this model provides a valuable operational tool for participatory management and conflict prevention on park peripheries.

The fourth concerns the phase of **capitalization** based on the creation of an interactive community mapping system able to manage a very wide geo-database visualized by interactive maps useful for park managers but also for every user, as it is published on the web (Figure 7).
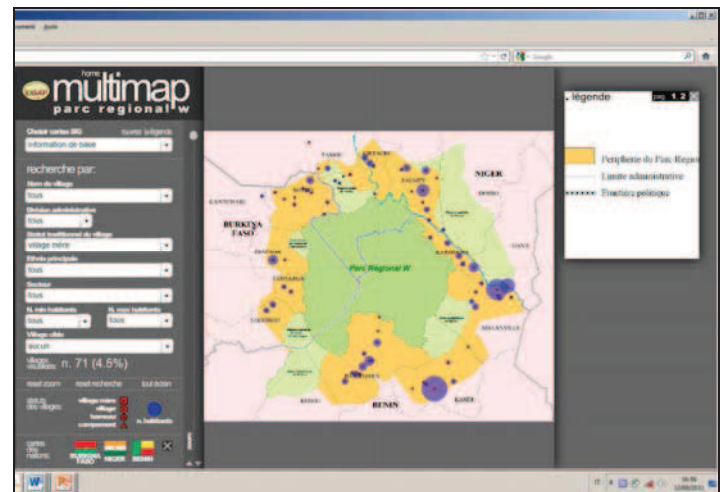

Figure 7 – The Multimap interface (www.multimap-parcw.org)

CONCLUSION

The SIGAP Strategy is intended to meet the difficult task of finding methods and tools to be used immediately in practice, so that planning may yield concrete results based on thoughtful consideration of traditional socio-territorial systems, in compliance with the theoretical goals set up in policies of sustainable development. More exactly, on the basis of recent acquisitions in the fields of complex representation systems and of new theoretical approaches on the communication concerning the deep meaning of territory, we set out to develop a new conceptual model of reflexive cartography that can sensibly contribute to the defining a participatory approach. This is achieved by marking territorial zones of intervention and by careful plans aimed at a sustainable exploitation of resources and at long-term participatory management of park peripheries.

NOMENCLATURE

SIGAP	*Geographic Information Systems for Protected Areas*
PM	*Participatory Methodologies*
Arly UPC	*Arly Unity of Protection and Conservation*
WTBR	*W Transboundary Biosphere Reserve*

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