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A dynamic GIS as an efficient tool for ICZM (Bay of Brest, Western France)?

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Abstract

This contribution deals with the role of geographical information in participatory research concerning coastal zones and its potential to bridge the gap between research and coastal zone management. The study aims at modeling the interactions between human activities in a maritime basin. A dynamic GIS is used as a tool to facilitate the exchange of points of view and to share knowledge. Geographic information technologies are used at several levels: data collection, GIS analysis, mapping, and simulations. The results show that the GIS-based capture data is well managed by the stakeholders who are interested in contributing to the process of gathering scientific data. The results of a participatory workshop with stakeholders show that the dynamic component of the data adds a real value for management. The possibility to use such a dynamic GIS to discuss and simulate management scenarios is tested, but it needs to be built up gradually.

Introduction

Among others, Opdam (2010) argues that communication between science and society is valuable for planning. Consultation methods have evolved during recent decades, partly through advancement in information technology, especially by using GIS and GIS-based tools (Stelzenmüller et al., 2013). Many case studies have demonstrated the value of GIS in the participatory process of integrated land-use planning by supporting local and expert spatial knowledge (Brown, 2006; Hessel et al., 2009; Arciniegas et al., 2013). Some of them involved collaborative processes in virtual scenario simulations, particularly in coastal areas (Jude, 2008; Jude et al., 2007). These studies rely on geographic information technology to optimize management strategies and public participation in integrated management stakes (Gourmelon et al., 2013; Smith and Brennan, 2012; Alexander et al., 2012). However, only few of these studies deal with the evaluation of interactive spatial support tools (Arciniegas et al., 2013; Eikelboom and Janssen, 2012). Our study aims at filling this gap and improving participations and interactions between researchers and stakeholders by using a dynamic GIS dealing with maritime activities. The Bay of Brest (Brittany, France) constitutes a coastal zone where many diverse maritime activities take place. For this case, we used modeling as a conceptual framework to understand a complex social system. Then we developed a tool to facilitate sharing of knowledge between local stakeholders such as fishers, managers and researchers. Firstly, we emphasize that exchange of data, knowledge and points of view are of prime importance in ICZM as a participatory process (Rockloff and Lockie, 2004). Secondly, we consider modeling as a way to facilitate sharing our collective and interdisciplinary beliefs and facts (Becu et al., 2008). The specific role of spatial data in connecting stakeholders involved in maritime activities in the Bay of Brest is presented in order to assess the effectiveness of this approach for further operational actions.

Methods

Various geographic information technologies were used at several levels and along logical steps (Figure 1): 1) an extensive database is built into a GIS; 2) during a GIS-based interview procedure, maritime activity zones were mapped by directly involving stakeholders; 3) temporal data were linked to activity zones to provide models of interactions between activities at different dates and under specific regulatory or weather conditions; 4) finally, this dynamic GIS produced different types of maps: per activity or including multiple activities with a spatial or a spatio-temporal component. The value of such a GIS within the participatory process is tested at two stages in the process: 1) at the time of data capture, 2) for stimulating discussion and exchange of points of view, and building collective scenarios.

Data collecting phase

A survey method was developed to collect spatial data using GIS as a mediation tool. We have opted for semi-structured interviews based on expert opinions (Tremblay, 1957). The key informants are presumed to have a special
knowledge about our target population (Rubin and Babbie, 2005). They were identified among organized activities throughout the bay. Thirty-two semi-structured interviews were carried out with key informants for twenty-seven activities. During the interviews, a tablet PC enabled them to map their activity zones on a touch screen.

**Supporting discussion and building collective scenarios phase**

A participatory workshop gathered six local agencies involved in coastal management (ICZM, Natura 2000, Watershed management) and one representative of local commercial fisheries. The session was managed by one moderator and one observer to record all participants’ reactions and discussions. We collected perceptions of the participants about this methodology, the dynamic GIS, and its possible relevance for the Bay of Brest to initiate simulations. Finally, an assessment of this three-hour session was made and analysed.

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**Figure 1.** GIS dynamic sharing process.

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**Results**

**Data Collection**

Using GIS, and especially its dynamic multi-scale display capacity, enabled us to create geographic data layers on the basis of the scales used by stakeholders while mapping their activity zones. It stimulated cooperation and exchange of knowledge between stakeholders and researchers. For spatial data collection, 28 interviews have been conducted: 3 for maritime transportation, 6 for commercial fishing and 19 for nautical activities. Only two key informants did not directly use the GIS (because of their poor eyesight). The others handled the GIS software to map their activity zones. This personal involvement was a real success, probably thanks to the capacity of these key informants to manipulate digital maps. Their activity zones are incorporated in the GIS, which provides people with maps of organized activities such as commercial fishing, water sports (windsurfing, sailing, kayaking, rowing, scuba-diving) and maritime transportation (passengers) (Le Guyader, 2012).

**Discussion and building of collective scenarios**

Modeling human activities taking place in the Bay of Brest has been discussed between all participants. The issues we raised show that the participants have perfectly assimilated this dynamic GIS and the computer simulations. However, when they were asked to suggest one collective scenario that could be implemented in the
model, three different proposals were put forward. All participants asked the research team for a second workshop to
discuss the results of simulations based on the three scenarios in addition to one workshop tailored for decision
makers involved in ICZM and another tailored for fishers. The final assessment of our research by the stakeholders
reveals that they: 1) have got better understanding of how all maritime activities occupy the bay in terms of space
and time (based on daytime) and what kind of interactions among them may occur, 2) appreciated the workshop
organized by the research team to support discussion among stakeholders in a “neutral arena”, 3) think that this type
of session could modify the collective perception of the ICZM stakes.

Discussion

Contribution to a planning process

This framework produces a sound base for some aspects of the Natura 2000 procedure, which was launched in
2012 in the Bay of Brest. France is one of the European countries that conduct decentralized and contractual
approaches for all these activities in Natura 2000 areas (Buller, 2004; McCauley, 2008). The target document is
created on the basis of a consultation procedure. A steering committee is set up under the responsibility of a local
non governmental organization or a local administration (Armorique Natural Park in the Bay of Brest). In order to
contribute to this process, GIS data produced by our research have been transferred to the Armorique Natural Park
and also to the Pays de Brest that manages the ICZM process.

A way to integrate some parts of local knowledge

Our approach also contributes to integrate local knowledge into ongoing management processes. Integrating that
kind of knowledge aroused more and more interest of both researchers and managers in the context of natural sites
management, because it is complementary and valuable. Furthermore, this volunteered geographic information
described by key informants constitutes the only solution to get data concerning their activities. To get people
involved in gathering relevant data is one of the challenges for citizen science (Irwin, 1995; Goodchild, 2007).

Potential for participation

Within the framework of integrated and participative management, the model-based approach encourages
knowledge sharing (Barreteau and Le Page, 2011; Gourmelon et al., 2013). But participation requires an access to
knowledge, and its appropriation by all stakeholders must be ensured. The model we developed on the basis of
multiple data on maritime activities in the Bay of Brest promotes the acceptance of the diverse knowledge and
perceptions by stakeholders with uneven skills. The spatial dimension introduced by maps stimulates the exchange
between researchers and stakeholders. The dynamic component of the GIS appears to be of prime importance. It
yields novel information about spatio-temporal interactions, which allows the stakeholders to qualify the activities
from the point of view of intersection occurrences. Evolution of activity zones and the locations of low or high
densities of possible conflicts are put in evidence. Nevertheless, even though computer simulations are attractive for
the stakeholders, building relevant collective scenarios still requires more time and several more sessions (Becu et
al., 2008).

The stakes

The use of such methods based on computer models and simulations, raises questions about their
instrumentalization in public policy (Becu et al., 2008; Gourmelon et al., 2012) and the emergence of a socio-
technical democracy (Steyaert et al., 2007). We also agree with Arciniegas et al. (2013) that the amount of
knowledge, the volume and the format of information, as well as the complexity and duration of the process
constitute a critical issue. The temporal component of the information we added looks more valuable for planning
than considering only the spatial component. We also agree with Eikelboom and Janssen (2012) on the necessity to
tailor the spatial tools for a specific context. Definitively, both a GIS-based approach and computer simulations
promote stakeholder involvement and encourages knowledge exchange and acceptance of scientific products, as
long as they are tailored to meet their specific needs.

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References


