METHODOLOGICAL ASPECTS OF THE INVESTIGATION OF COMPLEX INTERACTION AMONG PEOPLE AND BIODIVERSITY'S COMPONENTS

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Abstract: It has been concluded into last two decades that the effectiveness in the designing, implementation of strategies programs and particular projects, regarding biodiversity conservation, restoration and sustainable use of their components are highly depended on the involvement of different stakeholders and public in general in each stage of this process. The need to identify consultative and participative methods, to actively involve public in the decision making process proved to be one of the most critical socio-ecological research program launched and implemented since 2000 in long term socio-ecological research sites (LTSER) - Neajlov catchment and Islands of Braila. Thus, the Department of Systems Ecology and Sustainability – University of Bucharest has extended the research objectives from that regarding natural capital structure and functions to those aimed to economic valuation of natural resources and services and socio-analyses of people perceptions, attitudes and behaviours, in order to create the background for public involvement in decision making process.

Within this context has been carried out the activity for identification, testing and adaptation of a range of methods and tools already developed and applied mostly in a sectorial way in different projects. The paper present and discuss the results in a specific research program implemented in the two LTSER sites in order to establish the package of methods to be used for further researches in this particular field, covering the complexity of the mechanism and processes involved in the assessment of complex interaction between people and nature. Based on a set of selected criteria we have identified and proposed a package of four methods consisting in: questionnaire, interview, focus group and value clarification to be extensively used for socio-ecological research which will be carried out in the national LTSER network sites which is integrated in the European and global LTER/ LTSER networks.

Keywords: participation, consultation, method characterization, SWOT, biodiversity.

1. INTRODUCTION

The urgency and complexity of the current environmental problems require ecologists to engage in cross-disciplinary research including social analysis (Lowe et al., 2009) necessary for an appropriate research in a correct way of the human dimension of ecological systems (Phillipson et al., 2009).

As, early as 1975, Odum declared that under the pressing need to address "the totality of man and environment", ecology had become "a major interdisciplinary science that links together the biological, physical and social sciences".

Earth's ecosystems produce a wide scale of resources and services in benefit of humane society that satisfy different people needs, varying from the primordial necessities (food and drinking water) to others apparently less indispensable, such as aesthetic and recreation needs (Ehrlich & Ehrilch, 1992), (Constanza et al., 1997), (Vadineanu, 1998), (Vadineanu et al., 2004), (De Groot et al., 2002). The purpose of this study was not meant to develop new tools because a lot of methods were developed by sociologists until now. So we tried to select a pack of complementary methods targeted on socio-ecological research.

The applicability of the methods taken separately has increasing importance in the implementation of EU policies and directives. The purpose is to identify the relevant methods and to apply them in an integrated manner, in this case in terms of social capital.

Analysis conducted over several years led us to the identification of a set of proper methods for researches related to social capital, involved in the implementation of decisions. Social capital represents the interface between natural capital and human welfare. Active involvement of the public is one of the key to success in promoting sustainable development and biodiversity conservation (Rockloff, 2006). Lack of participatory approaches and lack of information and communication have led to severe problems in Western European countries, especially in relation to stakeholder involvement in decision making process (Hesselink, 2007).

Communication is a key instrument for implementing goals related to environmental protection (Varvasovszky, 2000). Communication deficiencies led to great difficulties in making environmental policies and in establishing networks of protected areas in several EU Member States. Communication and stakeholder involvement at an early stage have proven capable to accelerate the process in countries where this was well planned and implemented continuously. Consultative and participatory methods developed by sociologists have proven to have limitations in achieving their goal; therefore a brief analysis will allow each method to be used at full capacity.

2. MATERIAL AND METHODS

2.1. The study area

Social analyses were developed in Department of Systems Ecology and Sustainability – University of Bucharest (DSES-UB) when was observed that the results from the researches on natural capital are not suitable to be used in decisions making activity without extending those researches on social background. Therefore we extended our researches on social capital in biodiversity conservation context. We developed and adapted a set of criteria able to offer a better comparison of the social methods suitable for our purposes. Data was collected in two long term socio-ecological research sites: Neajlov catchment and Braila Islands.

Neajlov catchment is a sub-basin of the Argeş river in the South part of Romania (Fig. 1), having the following geographic coordinates: 43056'00 "N - 44049'12" N latitude and 24014'30 "E-26015'36" E longitude. Altitude decreases from 300 m in the North down to 60 m in the South (Vadineanu, et al., 2004). Neajlov catchment has a surface of 3720 Km^2 with a population density of 70 inhabitants/km^2. Most people rely on subsistence agriculture, because about 62.6% of the basin area is arable land. Basin is dominated by agro-systems (78.5%), semi-ecological systems (14.7%) and ecological systems created and dominated by the human activity (5.5%) (Postolache et al., 2004). The second site (Fig. 1) where were applied methods to evaluate social capital is Brăila Islands with a total population of about 300 000 inhabitants and a number of 21 human settlements, including a large city (216 000 inhabitants).

The Braila Islands, one of LSER at national and European level has a total area of 2597 km^2, comprising 4 districts and over 20 administrative territorial units. In Brăila Islands, the land use is predominantly agricultural (89.44%). Forests are 4.57%, while the aquatic systems cover 4.36% of total area. The remainder consists of grassland (0.64%), built-up areas (0.51%), wetlands (0.39%), shrubs (0.07%) and areas without vegetation (0.01%) (Oprina-Pavelescu et al., 2008).
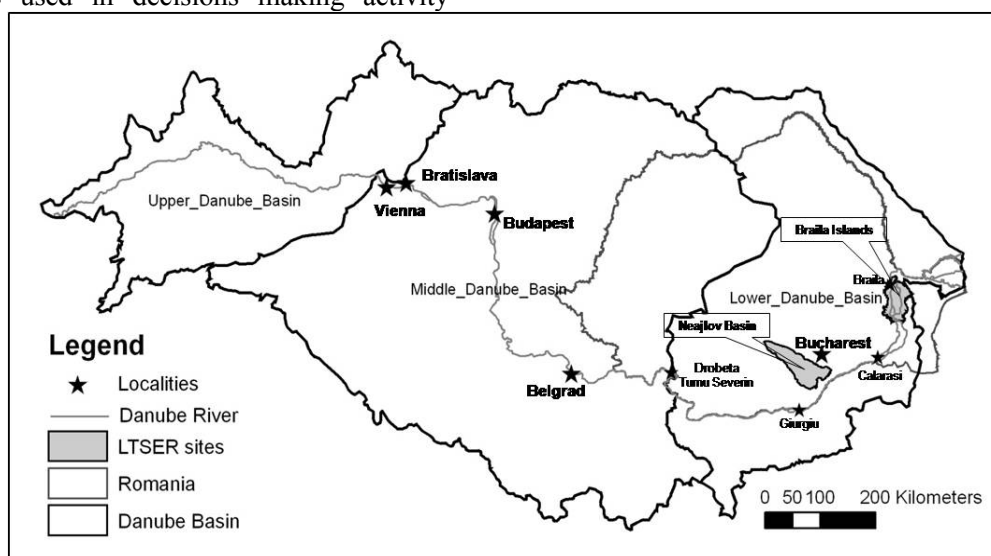

Figure 1. Location of the Neajlov catchment and Braila Islands at Romanian scale (Map created in the DSES-UB framework)

2.2. Methods

2.2.1. Questionnaire

The questionnaire is a technical and investigative tool, consisting of a set of written questions and possibly graphics, logical and psychological ordered by the administration of the operators or self-inquiry, determined by the responses to be investigated recorded in writing (Chelcea, 1975). Self inquiry eliminates the distortion of information due to the presence of the operators, but introduces some uncertainty about the person who actually answers questions (Friedrich, 1991).

2.2.2. Interview

The interview is a technique for obtaining information through questions and responses from individuals and human groups to verify hypotheses or scientific description of human social phenomena.

The interview is based on verbal communication and involves questions and answers like the questionnaire. Unlike questionnaire, where questions and answers are usually written, the interview always involves obtaining oral information. The conversation is fundamental for this technique. It is recommended to use the interview when is needed to study behaviours difficult to see, because it takes place in private and beliefs, opinions and attitudes can be studied (Stacey, 1970).

2.2.3. Focus Group

It was created by Merton to study persuasive mass phenomena: for example, knowing the effects it has on the public or a propaganda campaign. Its principle is "to explore the side subject to a situation that has lived it" (Maisonneuve, 1990). As interviews, the focus group is ideal for identifying current problems of the public, various groups of users and experts. Participants can chat in their own language and terminology about what concerns them because there are no questions and answers sessions with experts.

2.2.4. Values clarification methods.

Values are the leading behaviour. Once values are internalized, either consciously or unconsciously, a model to guide actions and decisions. Because the values underlie the choices, these options actually reflect the perception of what is right and proper at a certain moment of time

Values change over time in response to changes in life experiences. Recognizing these changes and understanding how they affect the actions and behaviour lead promoting the application of values clarification processes not only in education systems, but also in clarifying the issues that concern the morality of medical techniques, or as in this case, to clarify the values of the conservation biodiversity.

Values clarification methods are designed to "help people to reason in times of confusion of life to acquire attributes that will serve in future" (Chelcea, 1975). Methods are not focused on the transmission of values, because nobody has the right to establish values (Simon, 1971).

3. RESULTS

During 2003-2008 have been applied several interactive consultative and participatory methods in two pilot areas for long term research, in the framework of international projects developed under the DSES-UB. All these methods was analysed under five general criteria.

Some generally valid criteria were established as described by De Vaus (1996) in order to compare different techniques of investigation and used by Rotariu & Iluț (2001), depending on the need to highlight some advantages and disadvantages offered by these methods. Methods used were analyzed according to the following general aspects:

- Sampling quality
  - Sample size
  - Coverage of target population heterogeneity by providing representative sample:
- Information quality.
  - Data volume (information quantitative or qualitative): quantitative information is always easily measured and analyzed, providing clear and concise results, but sometimes qualitative information is required, which can explain the reasoning behind the respondents chooses options.
  - Identification of knowledge/values/ attitudes/ behaviours: it is a very important factor in choosing a method, especially for sites where research is conducted for long term because this step is necessary in adaptive management and public awareness strategy, depending on the time scale at which research is carried out.
  - Identification of conflicts/solutions: those techniques that rely on free discussion, easily controlled by moderator or operator, as individual and group interviews, structured, semi-structured or unstructured, could identify problems or alternative solutions.
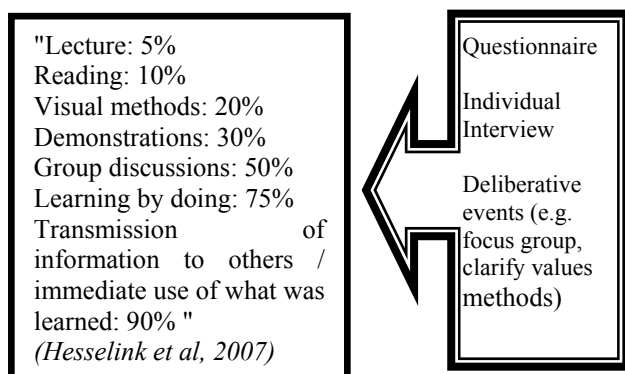- Impact of information (retention degree of information by respondents) (Fig.2)

| "Lecture: 5%
Reading: 10%
Visual methods: 20%
Demonstrations: 30%
Group discussions: 50%
Learning by doing: 75%
Transmission of information to others / immediate use of what was learned: 90% "
(Hesselink et al, 2007) | Questionnaire

Individual Interview

Deliberative events (e.g. focus group, clarify values methods) |

Figure 2. Percentage of received information retained by respondents according to the methods used.

Considering the fact that the methods described are analyzed in terms of consultation, participation and public awareness, we consider that the introduction of such a criteria is important, to highlight how much the respondents can retain information, according with the method applied. This was made by analogy to ways described by scientists in "CEPA - A toolkit for NBSAP" (Hesselink et al., 2007).

- Distortions due to:
  - o Characteristics and views of the operator
  - o Influences of others

Participatory techniques, often, may be influenced from other people; sometimes these influences are beneficial and help clarifying ideas, but sometimes they may affect desired results in a negative way, resulting in distortions that do not reflect real issues. It is desirable that before applying a certain method to know it's advantages and disadvantages according to research purpose.

- Quality of research:
  - o Time interval
  - o Number of persons involved in research.

Since the financial and human resources are generally limited, the preferred methods were those that could be applied in a relatively small period of time, at a low cost.

The criteria listed above are able to provide a hierarchy and a way to prioritize the choice of interactive methods whether advisory or participatory.

3.1. Questionnaire

The first tool refers to the study analyzed through the semi-structured (with closed questions, but also open) and structured questionnaire that include only closed questions.

3.1.1. Questionnaire with closed questions was used in the Neajlov catchment on a number of 107 respondents, using 2 interviewers in one session daily for 4 days during a month in the year 2004 (Mărmureanu et al., 2010). This questionnaire was implemented in the Evaluwet project. Questionnaire application was made after identifying of the main economic sectors (industry, commerce and agriculture) with impact on the environment in the Neajlov catchment. The head of the family was generally interviewed. This fact explains the structure of the sample, the male respondents being (60.75%) (Fig. 3) and average age of sample being between 40 and 49 years (Table 1).

Table 1 The average age of the sample

N	Valid	107	
	Missing	0	
Mean		4.32	Between 40 and 49 years
Standard Deviation		1.398	
Minimum		1	Under 20 years
Maximum		7	Over 70 years

The questionnaire included only closed questions with multiple choices, in order to obtain a high degree of quantitative information (Marmureanu et al., 2010), easily measured and interpreted, to identify:

- perceptions of managerial priorities: 21 items
- willingness to participate in the management plans: 24 items
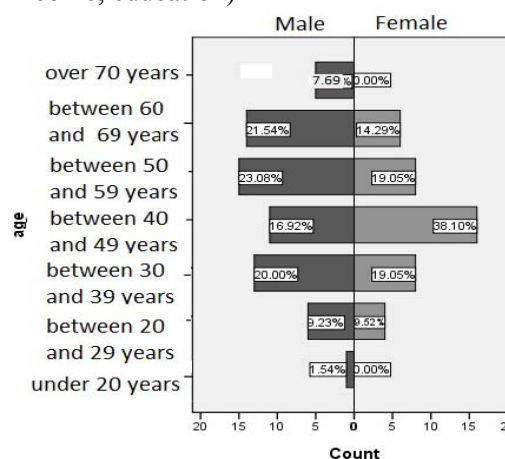- Factual data: 5 items (age, gender, occupation, income, education)

Figure 3. Population pyramid of the sample on gender distribution (Neajlov, 2004)

The questionnaire was designed in order to obtain more information. This led to a number of questions (50) which required a long time to fill the questionnaire (30-40 minutes). The time interval of the questionnaire presented some benefits, and connected with the fact that data interpretation was done easily, lead to obtaining quality quantitative

results that were not influenced by the operator or persons working on the analysis.

Although this technique is classified by sociologists in the category of interactive methods, it cannot be considered a method with a high retention of information by respondents because the interaction between the operator and the respondent was within 20-30 minutes and interviewee responses were guided by the type of question, in general, multiple choice, leaving no room for own ideas and a long discussion with the operator.

3.1.2 Mixed questionnaire was used in the AquaMoney project which covered opinions of the inhabitants of Braila Islands and Neajlov catchment related to availability of supporting environmental restoration projects in the Lower Danube basin. It was applied in Braila Islands (on a sample of 519 respondents) one week in November 2007 (Geamănă et al., 2010), respectively in Neajlov catchment (on a sample of 504 respondents) one week in March 2008, with 10 operators involved. The structure of the sample was consistent with age and sex structure of total population in the areas studied, with an average age of the sample of about. 45 years, the minimum age of respondents was 18 years and maximum was 84 (Table 2), of which males were 50.87% and 49.13% females (Fig. 5).

Table 2. The age distribution of the sample

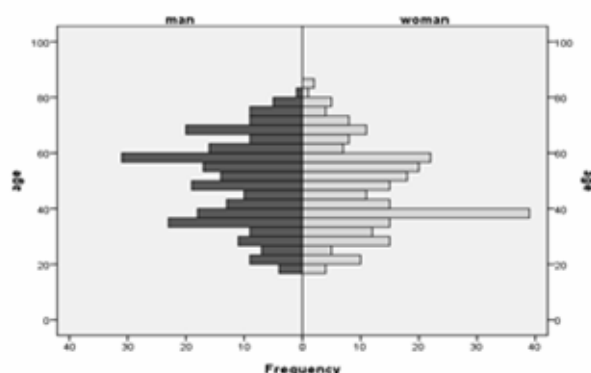| N	Valid	519
	Missing	0
Mean		44.47
Std. Deviation		15.585
Minimum		18
Maximum		84

Figure 5. Population pyramid of the sample
(Neajlov, Braila Ilands, 2007,2008)

The amount of quantitative information was over 95% of the data provided by structured questionnaire:

• attitudes and perceptions towards environmental issues: 19 items (multiple choice, open questions)

• willingness to participate in the reconstruction plans: 13 items (multiple choice, open questions)

• 7 items factual data (age, sex, occupation, etc.)

The questionnaire included open questions in order to obtain as much information as possible from respondents and to find out why they had chosen a specific response.

Being a rigid method, identification of issues, other than those examined, by the questionnaire is not possible. For example, identifying financial solutions to support the reconstruction plans was made according to the alternatives provided by the questionnaire, since in general there was no free discussion with the interlocutors. Most of the time, when information was transmitted to the operator, this was noted in a small proportion, because of the questionnaire structure. Even this information was noted by operators a part of it could not be quantified later, due to inflexible method used for the interpretation of data. However the questionnaire may well identify attitudes, knowledge and behaviours of the surveyed population that can be extrapolated to the entire target population due to the large volume of questionnaires that can be applied with a relatively small budget, thus ensuring representativeness.

Another survey with mixed questions entitled "Opinions of people about environmental change - The Braila Islands-November 2007" was carried out. The time interval was a factor that provided an advantage over other applied techniques due to low costs. The sample used was represented by 300 respondents, representative for the Braila Islands, regarding distribution by sex and age and the proportion of urban areas; six operators were involved (Geamănă et al., 2009). This questionnaire was applied in a work package of the AlterNet project that aimed to study public attitudes to biodiversity and its conservation.

The questionnaire was applied to a sample with ages between 18 and 81 years with an average ofabout 46 years (Table 3), male respondents were 51.33% and 48.66% females (Fig. 4), 33.33% were selected from urban areas, 44.33% in communes and 22, 33% in villages.

Table 3 The age distribution of the sample

N	Valid	300
Mean		45.75
Std. Deviation		14.514

Figure 4. Population pyramid of the sample
(Braila Islands, 2007)
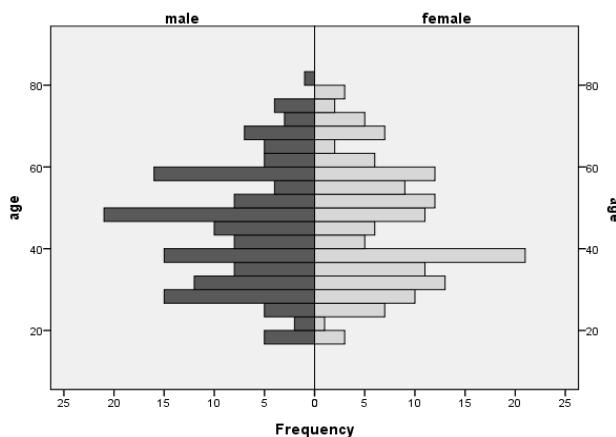
The method provided a large volume of qualitative data because the questionnaire applied was made mainly with closed questions:
- perceptions/attitudes about biodiversity: 16 items (multiple choices)
- attitudes/knowledge/behaviour regarding biodiversity conservation: seven items (multiple choices)
- factual data: nine items (gender, age, occupation etc.)

The questionnaire is a rigid method, but applied to a larger scale, increases its representativeness; the margin of error regarding to the views of respondents is very low; the amount of information that could be collected by individual free discussion or group discussions is decreased.

Strict questions in the questionnaire offer the advantage of clear answers, guided by the response alternatives, which could lead to identification of behaviour toward certain aspects studied; the errors induced by the operator are insignificant compared with other methods. The errors induced by operators are possible just for open questions.

3.2. The interview

Was another technique used and tested in the Neajlov catchment area during few weeks in 2003. This interview was applied through the project Evaluwet for external and secondary users using guided interview methodology. This technique has been applied to local authorities, Romanian Waters National Administration, the National Oil Company Petrom SA, seeking to identify:
- key issues of organization/institution
- the most important natural resources for the organization
- the most important natural resource services

- major issues regarding the use of resources

The interview guide was applied to 23 individual representatives of secondary users in accord to total targeted population by 1 operator.

Data resulted from the application of this method are qualitative and analysis is more difficult, but provides a larger volume of information. Since it was a structured interview, the information collected was limited to questions and the process to identify certain issues was relatively easy.

Individual interview provided the advantage that the responses were not influenced by others and the discussions were not diverted to other unimportant issues, but allowed influences from the interviewer. Like other methods analyzed, the lack of possibility to consult with others can be considered a disadvantage in the formulation of complex responses, correct and complete, especially when the aim is to collect as much data related to the activities of respondent's organization.

3.3. The focus group

Is a method widely used to analyze aspects of biodiversity conservation, environmental protection etc. and was applied, in 2004, for secondary users of the Neajlov catchment, in few sessions, in the framework of Evaluwet project.

It offered the advantage that a session could be applied with low costs, without involving a large number of moderators or long time. In order to obtain complete results was necessary to apply this technique in several sessions.

The focus group was applied in 5 sessions each day, on groups of 8 - 10 participants, a moderator and two operators that helped in compiling all information provided by respondents.

The interview was structured in order to obtain data related to attitudes and knowledge of certain aspects of biodiversity conservation and resource management issues, both positive and negative, trying to capture the view of the organization or institution represented by the respondents.

As mentioned also by other researches, (Rotariu & Iluț, 2001) this case shows some influences received by certain respondents from the most active participants, although all were advised to write before the interview their own ideas and answers to questions.

Methods that use discussion and interaction among participants like this method, involve retention of information and attitudes and knowledge changing.

3.4. Values clarification methods

For this, have been developed and applied two values clarification methods, in the Braila Islands in the framework of the AlterNet project, from March to August 2005. The area is a protected area of national and international interest and the methods were applied in Stancuta village where is located the Information, Education and Visiting Center of Small Island of Braila Natural Park and, in the city Braila - the only city from this area of interest.

3.4.1. Values Ranking

It was applied during four sessions, one in the Braila city and three in Stăncuța area that aimed to study perceptions and attitudes on biodiversity and its conservation. For two of the sessions, the selected groups of participants included owners of 'small' farms (less than 5 hectares) and 'large' farms (over 50 ha) from the Small Island of Braila; they were held in the same day. At each session attended different groups of 19 and 16 participants, all were men aged 20 to 60 years.

For the remaining two sessions, the participants were "experts" (representatives of organizations with statutory responsibilities for the conservation of biodiversity) and local representatives, "non-experts (representatives of private companies) secondary users. Two separate sessions were held on different days and locations, one in Braila and the second at Stancuța. At each session attended different groups. These groups had 18, respectively two participants, including 11 women and 9 men aged from 20 to 70 years (Buijs, et al., 2006).

The method involved the providing of materials related to the discussed topic and a questions list. Each question asks participants responses to certain situations. Three alternative answers are provided for each question (Buijs, et al., 2006).

3.4.2. Values Grid

Four Values Grid sessions were carried out. For two of them, the groups of participants consisted of "debutant" (less than 5 year experience) and "experienced" (over 10 year experience) fishermen from the Small Island of Braila Protected area. Two separate sessions were carried out on the same day, each session engaging one of the two "contrasting" groups. The two groups comprised by 17 and 18 participants respectively. All participants were male, aged between 20 and 70. For the two other sessions, the participants were "experts" (representatives of organizations with statutory responsibilities for

biodiversity conservation), and "local, non-expert" (representatives of private businesses) "secondary stakeholders". Two separate sessions were carried out on separate days and in separate locations, one in Braila and the other in Stancuța. The two groups consisted of 18 and 2 participants respectively. The gender distribution of participants was 11 females and 9 male. The participants were aged between 20 and 70. Written instructions including an overview on biodiversity and the ongoing session was handed to participants, together with a Values Grid form and a personal factual data form. The moderator provides information on the forms and the event structure and encourages participants to interact and agree on a number of three to six biodiversity relevant issues in their community. Afterwards participants are encouraged to form small groups of 3-6 persons and to discuss the matter an issue identified in the discussions up to that point and establish their position. Finally participants were encouraged to interact (Buijs, et al., 2006). The tested methods helped us to gain experience in social analyses and increased public awareness that led us to establish some methods necessary to reach the biodiversity conservation purposes. Analysis carried out during these years, both literature and tested methods, allowed us to design a set of methods that can be applied both by the type of user and message-communication aims (Table 4).

4. DISCUSSIONS

Examining behaviour and belief systems requires both quantitative and qualitative approaches to research: i) quantitative methods to understand the prevalence of particular practices, behaviours, and beliefs, and; ii) qualitative methods to understand meanings, functions, goals and intentions (Yoshikawa et al., 2008).

Beliefs, goals, and practices are particularly interesting when they are not congruent. The combination of quantitative and qualitative evidence can shed light on why this is so.

Mixing qualitative and quantitative approaches brings up vexing tradeoffs regarding how to sample. Typically, qualitative samples are smaller than quantitative samples because of the time demands of qualitative data collection and analysis (Yoshikawa et al., 2008).

Some researchers (e.g. Way and Pahl, 2001; Way, Gingold, Rotenberg, and Kuriakose, 2005) collect both in-depth qualitative interviews and survey measures from entire samples of hundreds of participants. Other approaches involve identifying the viewpoints of all those who are or will be

affected by a project, as well as the relationships and conflicts among the key players (Brugha & Varvasovszky, 2000; Varvasovszky & Brugha, 2000) or clarifying possibilities and constraints surrounding instances of natural resource management (e.g. McCreary et al., 2001; Horowitz (2008) used the methods that involve participant observation and semi-structured interviews (Bernard, 2002) with people who resided near the areas proposed for protection using stratified random sampling to interview approximately 10% of the population of the target group. These approaches regarding the use of qualitative or quantitative methods are very diverse so these analyses underline the need to identify the advantages and disadvantages of every method.

Accepting the significance of the social background of a landscape while designing a conservation policy will improve its internal coherence and functionality, will increase its perceived legitimacy, and as a consequence, promote local acceptance. The process of social data gathering and negotiation results in the "de facto" incorporation of local knowledge, institutions and individuals into the designing and management of the conservation policy (Vaccaro and Norman, 2008). Local participation has become a key element that managerial institutions all over the world, with more or less success, are trying to explore and incorporate (Macinko and Bromley, 2002; Russell and Harshbarger, 2003).

The analysis of the methods applied in long-term research sites, during 2003-2008, is summarized in Table 5, showing the function of the 5 major criteria analysis above, the quality of the techniques studied.

Table 4. Set of methods proposed

Organization / Method	External stakeholders		Secondary stakeholders						Primary stakeholders			
	Ministry of Agriculture	Ministry of Environment	Scientific Institutions	NGO	National and local Environmental Protection Agency	Park Administration	City Councils	Local environmental control authorities	Schools (teachers)	Land owners/ farmers / fishermen	Churches (land owners, priests)	Goal of communication
Interviews	X	X	X	X	X	X	X	X				Identification of the solutions to different issues
Questionnaire									X	X	X	Rendering of the key message Identification of the solutions
Focus group	X	X	X	X	X	X	X	X		X	X	Identification of the solutions including traditional knowledge
Values Clarification					X	X	X	X		X		Evaluation of advantages and/or disadvantages. Value identification

Table 5. SWOT analyses of the tested methods applied between 2003-2008

	Mixed questionnaire	Questionnaire with closed questions	Structured interview with a face-to-face administration	Focus group	Values clarification methods
Strengths	Large sample. Ensure representativeness at a relatively low cost. Open questions provide additional information in explaining the choice made by the respondent. Easy to apply. Answers to questions are low influenced by other people or operators. Data obtained are readily analyzed by statistical analysis. You can easily identify the attitudes and knowledge of respondents.	Large sample. Ensure representativeness. Method easy to use. Data are easily measured and analyzed by applying statistical analysis methods.	There is no distortion due to other people. Responses are expressed freely. Due to structure, the discussion guide is not diverted to other topics. It can identify problems, attitudes, knowledge. Qualitative information provides an increased volume of data. The respondent may request additional clarification.	Participants interact with each other. It may clarify certain issues and can identify solutions to potential conflicts. It is a relatively cheap way to involve the public when applying multiple sessions. A lot of quality data is obtained from group discussions. The degree of retention of information by participants is much higher compared to the questionnaire and interview. The required number of operators is small.	Allows interaction between participants. Through the questionnaire every participant has the opportunity to express individually. Large sample with a low cost (up to 30 participants per session). Strict structure. Qualitative and quantitative data is collected. Low number of operators (Buijs et al., 2006).
Weaknesses	Respondents can express their opinions freely just in small proportion. Qualitative information is insufficient No interaction with other people (others then operators), so there cannot be discussion for clarification. The information point will not lead to further clarification on the issue under review.	The method does not allow free expression of opinions and views. You can not identify the motivations underlying the choice of responses. New information by applying the questionnaire doesn't have an increased impact on the respondent.	You can not quantify statistical comparisons between some areas due to lack of qualitative data. No interaction with other people. Sample size cannot be too big taking into account the time needed to conduct the interview.	Should not apply to larger groups of more than 8-10 respondents. Discussions can be monopolized by some participants that are actively involved, so it requires a well trained moderator. The lack of quantitative data leads to a slow data interpretation.	Restrict participants only at selected issues; other relevant issues can be ignored (Buijs et al., 2006).

	Mixed questionnaire	Questionnaire with closed questions	Structured interview with a face-to-face administration	Focus group	Values clarification methods
Opportunities	Offers the possibility of further more detailed investigations by other methods or active involvement of the respondents in solving problems.	The method can be applied by phone. It is a method you can apply in a short time when many operators are involved with obtaining large amounts of data.	Can be combined with other methods for obtaining additional data. Apply for small groups previously identified.	The method can be used for the integration of local features, conflict resolution and participation in decision making.	Strict structure offers the advantage of comparison between groups. It can be used to investigate changes of attitude. Additional information may be obtained by transcription qualitative group discussions (Buijs et al., 2006).
Threats	Questionnaire design errors cannot be corrected later. Need a large number of operators for large samples	Strict analysis of quantitative data by statistical methods does not provide a comprehensive characterization of the values and attitudes. Questionnaire design errors cannot be corrected later. Need a large number of operators for large samples.	It may appear distorted information induced by operator. It is not applicable on big groups without having bigger costs because moderators have to be instructed before, information can be extrapolated only if it is applied on a big sample.	Errors can appear when the discussion is not very well supervised by the moderator.	Values ranking need a thoroughly selection and content pre-testing (Buijs et al., 2006).

Although this paper is focused only on methodological aspects, in these studies a large volume of information related to respondent's perceptions, knowledge, attitudes was identified at each level of stakeholders (primary, secondary or external). These identified aspects will be more detailed in a further paper. We identified differences between access to educational systems, knowledge that are not so high regarding environmental issues and local population behaviors related to services and goods provided by natural capital (Fig. 5).

Comparison between the two sites
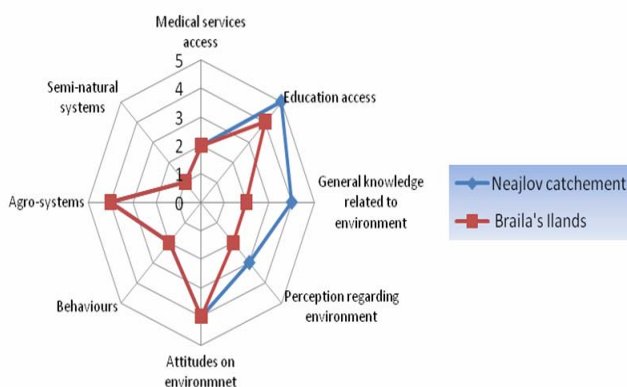
Figure 5. Amoeba diagram regarding some cognitive aspects of social capital, medical and educational access and type of ecological systems.

The local population has had a growing interest in the problems of environmental issues even if their knowledge level is not increased.

Even if the attitudes of the respondents related to environment in general, conservation issues or reconstruction or rehabilitation are positively, the implication of local population through financial resources is low or limited (due to their low incomes).

The Amoeba diagram represents a view of relations between social capital and biodiversity's components, results of the studies mentioned above.

This diagram was made by analyzing the statistical data provided by the National Statistical Institute or collected from questionnaires:

- regarding access to medical, health services or educational system was considered the maximum level (five points) reported to the national ones;
- general level of knowledge, perceptions, attitudes and behaviors was provided by questionnaires, where answerers were coded, aggregated and sores were scaled from 0 to 5;
- scores of the agro-ecosystems and semi natural systems, corresponding to the percentage hold by them in ecosystem complex of the regions.

After analyzing the information collected through interview, focus group or values clarification methods related to secondary stakeholders is clear that they are experiencing major problems with water quality, mainly deriving from the lack of facilities and budgetary or private investment. Identified practical solutions regarding both the conflicts that arise between organizations and between the other beneficiaries are closely linked with better communication and facilitate it.

These methods allow us to identify conflicts between different organizations, generated by the inadequate measures taken by each user, not taking into account the interests of others. So, garbage disposal on routes for access to oil drilling wells is a measure decided by local municipalities. The location of oil drilling wells near the river and their contamination implicitly lead to conflicts with organizations that manage this resource. Land abusive restitution generates conflicts situations also between the beneficiaries, municipalities and forest districts.

The interview applied at external stakeholder level revealed that environmental issues are reflected through the view of environmental agencies activities and other agencies involved in law implementation.

Environmental contraventions control and estimate of the costs related with this is one of the major problems that require external assistance and training on how to implement and control.

5. CONCLUSIONS

Methods can't be classified in good or less good, but can be analyzed in terms of best results that can be obtained by consultation, participation and public awareness. This paper, based on a set of selected criteria, identifies and proposes a package of four methods in accord with their advantages, consisting in: questionnaire, interview, focus group and value clarification to be extensively used for further socio-ecological researches.

The questionnaire, the most used method, for its high volume of data that can be obtained, its sample, it's relatively simple interpretation and due to minimum distortion induced by operators or other persons. The mixed questionnaire led to best results since were obtained complex interpretation of results.

The face to face structured interview, a method that was tested on a small sample, can't be applied on a large scale because synthesizing and interpretation of resulted data is more difficult requiring experimented operators that is able do not induce errors.

For small groups of respondents, the most studied method used to identify conflicts and active involvement of respondents is the focus group that had a large impact on participants in the large amount of information retained following the free discussions.

Values clarification methods are used in educational methods, adapted for the study of biodiversity conservation issues that led and obtain information related to internal motivation, cultural and social, but are more difficult to use due to the need for operator's skills.

All these methods, simultaneously used, lead to the identification of different views and possibilities of reconciliation, promoting long term sustainable solutions and generating motivation. Also are important tools to implement goals and objectives, acceptance of management measures, procedures and to create a commitment to the implementation of management plans and to conduct objectives towards targets.

The opportunity to be actively involved and to contribute to the planning process encourages shared responsibility for common problems and balancing the forces between different groups of stakeholders. Participatory processes also strengthen local democracy and willingness to cooperate for the benefit of local government and politics.

The way that different factors can influence attitudes and behaviours of the local population is not clear, but is known that the society will continue to become increasingly dependent on the environment. This requires particular interventions in education, political and campaigns to change attitudes and behaviour.

Attitudes are shaped by a number of different factors such as age, social and economic status, ethnic origin, birthplace and residence, knowledge level related to urban or rural areas and, maybe, the most important, the environmental values.

Social capital requires a continuous analysis, because most often it is understood as a final result and not as a variable which depends on the particular socio-economic development.

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