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Lars Lönnstedt and Björn Rosenquist (eds.)

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Assessing protected areas management using soft systems analysis: The case of Carrasco National Park, Bolivia

Alvaro Rico

Abstract
The establishment of protected areas has often been a top-down process, based on elitist concepts of land use and surrounded by restrictive legislation. Many protected areas and buffer zones in Bolivia, as in other countries, exist only on paper. The objectives and guidelines for their establishment are either not viable or unclear, resulting in management plans being overly simplistic or non-existent. In this study the various problems associated with the implementation/non-implementation of protected areas and buffer zone are considered from a systemic perspective. The paper outlines the application of soft systems methods to approach a complex problematic situation and presents preliminary results for protected areas in Bolivia.

Key words**:** Community Development; Conflicts Analysis; Local Participation; Buffer Zone; Soft Systems Methodology

Introduction

The management of protected areas (PAs) in developing countries presents profound challenges, given widespread conditions of poverty, rapid population growth, and political instability. PAs are buffeted by these local conditions and by powerful international forces as well. Although globalization and neoliberal reform have brought greater external funding to developing countries for PAs, these same reforms have also opened remote areas to logging, oil extraction, and mining (Bowles et al., 1998). Conservationists thus struggle to build alliances with communities neighbouring PAs while simultaneously defending parks from industrial-scale resource extraction and promoting sustainability in national policies (Naughton-Treves et al., 2005). In this respect, buffer zones (BZs) have in recent year become widely known as an operational approach to nature conservation, and are often applied in Integrated Conservation and Development projects (ICDP)/(Ebregt and De Greve, 2000). Despite the creation of the first Bolivian PA in 1939 (Sajama National Park), SNAP (Bolivia's National System of Protected Areas) is one of the youngest in Latin America. Established through the Law of the Environment 1992, its fundamental objectives is the conservation of representative samples of the country's major ecosystems and it is administered by SERNAP (Bolivia's National Protected Areas Service), under the jurisdiction of the MDSP (Bolivia's Ministry of Sustainable Development and Planning). The SERNAP is responsible for defining and enforcing the laws and regulations pertaining to the management of the country's genetic and biological resources, as well as to administer and implement the Convention of Biological Diversity signed by Bolivia at the Rio Conference (1992) and ratified in 1994. At present SNAP is composed of 22 nationally recognized PAs, covering approximately 17 million hectares (15,82 % of the national territory) and divided into National Parks, National Reserves, Biosphere Reserves, Wildlife Reserves and Integrated Management Natural Areas. In parallel with SNAP, there is a growing contingent of PAs of lesser hierarchy, such as Forest Reserves, Watershed Protection Areas, and Departmental, Regional, and Municipal Parks and Reserves. Although Bolivia's PAs include some of the world's most biodiverse areas, they are also home to a large part of Bolivia's poorest people. Poverty rates in and around PAs average 80% (USAID, 2005).

Since SNAP and SERNAP were implemented, important improvements were incorporated in the PAs management system, one of which is the conformation of committees for the development and implementation of the areas' management plans. Some PAs have active committees and approved management plans, and a few are even reviewing the plans after years of implementation. Other PA areas have neither committees nor management plans (e.g., Carrasco) and are threatened by conflicts with pre-existing communities or new immigrants. All PAs in Bolivia have local communities within or around their perimeter. It is estimated that about 1.5 million people, indigenous and others, mostly in poverty, are living within and around PAs (USAID, 2005).

The development challenge to authorities in Bolivia is to manage PAs for producing tangible benefits to local communities and alleviate poverty, thereby helping to conserve the PAs' globally important resources in a sustainable manner. In that way, BZs are seen as important tools to both conserve areas of ecological importance and address development objectives of local people (Ebregt and De Greve, 2000), (SERNAP, 2005b). In late 2005, official reports from SERNAP (SERNAP, 2005a) point to main challenges to PAs and BZs management: on one hand, the difficulty of defining clear concepts of PA, BZ, and their zoning functions; and on the other hand, the multiple conflicts reported in all of 22 existing PAs. Moreover, the urgent need to promote and to improve local participation in the managing of PAs, as it is strong demanded through the new slogan produced by SERNAP saying: "*parks with people*" (SERNAP, 2005c).

The general objective of this paper is to contribute to a better understanding of the current situation of PA and BZ management in Bolivia; more specifically: *i*) to review the general context about the establishment of PAs and BZs, *ii*) to analyze the relation between PAs and community development, *iii*) to analyze the main issues of the complex problem situation in Bolivia's PA management, *iv*) to analyze the case of Carrasco National Park (CNP) management from a systematic and systemic perspective, and *v*) to analyze the potential applicability and usefulness of Soft Systems Methodology (SSM) on the CNP case study as a pre-fieldwork stage.

Soft Systems Methodology

The Systems Thinking is an interdisciplinary and comprehensive approach to the analysis and unfolding of complex problem situations (Hjortsø, 2002). Therefore, Systems Thinking constitutes a compelling answer to the above-mentioned search for a problem-solving platform.

At the heart of SSM is a comparison between the world as it is, and some models of the world as it might be. Out of this comparison arises a better understanding of the world ("research"), and some ideas for improvement ("action") (Dick, 2002). Recent literature and the earlier SSM literature also, offer a 7-stage description (Checkland's methodology), which follows.

The problem (situation unstructured): the researcher makes as few presumptions about the nature of the situation as possible.

Rich picture (the situation analysis, issues and primary tasks): the researcher develops a detailed description, a "rich picture", of the situation within which the problem occurs. This is most often done diagrammatically.

Relevant systems and their Root Definitions: Now the "root definitions", the essence of the relevant systems, are defined. For the logical analysis, Checkland (1981) provides the mnemonic CATWOE as a checklist for ensuring that the important features of the root definitions are included: (i) the Customers, who are system beneficiaries, (ii) the Actors, who transform inputs to outputs, (iii) the Transformation, from inputs into outputs, (iv) the

Weltanschauung, the relevant world views, (v) the Owner, the persons with power of veto, (vi) the Environmental constraints, that need to be considered.
Conceptual models: The researcher now draws upon her knowledge of systems concepts and models. She develops descriptions, in system terms, of how the relevant parts of the situation might ideally function.

Comparison of conceptual Model with Rich Picture: The purpose is not to implement the conceptual models. Rather, it is so that models and reality can be compared and contrasted. The differences can be used as the basis for a discussion: how the relevant systems work, how they might work, and what the implication of that might be.

Debate with people involved in the situation: From the discussion the last step above, certain possible changes are identified. They are likely to vary in desirability and feasibility.
Implementation of agreed changes: The most desirable and feasible changes identified at the above stage are now put into practice.

Application of Soft System Methodology to Carrasco National Park case study
Carrasco National Park background
In 1988, CNP was declared in an initial surface of 180,000 hectares, in 1991 increased to 622,600 hectares as mitigation of the environmental impact generated by the construction of the Chimoré-Yapacaní Highway between Cochabamba and Santa Cruz, and to incorporate the *Cavernas del Repechón* Wildlife Sanctuary, created in 1986 (SERNAP, 1999).

In the beginning of 1980 the unplanned increment of population in the northern limit of CNP initiated a progressive pressure on the park and that constitutes one of the main reasons for the several social, economic, environmental, and political conflicts currently found in the area (CERES, 2000). In those days the critic economical situation of the country made immigrants start grow coca illegally within and around CNP, which having to increased the difficulty to open spaces of dialogue and made distance between CNP authorities and local communities within and around the park.

Currently, CNP is subjected to severe direct and indirect pressures and threats, jeopardizing its medium- to long-term viability, including: Pressures like illegal settlements and land invasions, agriculture, timber extraction, cattle raising, hunting and fishing, oil drilling; and threats like drug-trade related coca production, social resistance, and local participation (ParksWatch, 2005)**.**

Recent studies on the efficiency and effectiveness in the management of CNP conclude that there is an extremely high risk that the park will fail to protect and maintain biological diversity in the immediate future (O'Phelan & Argandoña, 2001; Pauqet, 2005). According to these authors CNP appears considerably behind the rest of PAs in Bolivia and the following aspects are considered the main issues for improvement: local participation improvement, protected area boundary definition, protected area regulations, protected area design, make a management plan, zoning, increase staff number, improve staff training, implement research, enforcement activities.

In 2005, SERNAP in its Strategic Agenda initiated a long-term strategy to systematically approach relevant stakeholders, including especially local participation as one of the most important inputs to deal with the paradigm "Protected Areas with People", putting emphasis on the social and political dimensions (SERNAP, 2005b). The implementation of this strategy is particularly important in the case of CNP because of its strategic geographical location in the middle of the country and its potential role as a guide for a participatory management in the PAs in Bolivia, considering its status as a one of the most threatened PAs in the country.

Applying Checkland's methodology (7 stages)

This paper is mainly based on literature survey, previous knowledge on the subject and study area situation. It was decided use SSM as the overall framework to obtain for the further research on the development of CNP, as it was perceived to allow incremental development based on ongoing discussion (Hjortsø, 2002).

Stage 1. The problem situation unstructured: During the initial exploration phase, few presumptions are formulated based on the collected information: Lack of social and local participation on the design, establishment, and management of Pas, too many conflicts to deal with in the short term, social resistance, international dependence for funds, complex situation. The key sector of stakeholders (SHs) in the management of CNP were identified: (i) Public sector composed basically of the authorities of CNP who are part of SERNAP; (ii) Civil Society, here the Association of Municipalities of the Tropics of Cochabamba representing local communities within and around CNP; (iii) International Cooperation comprising Foundations, NGO's, and (iv) Agencies and Research institutions mostly in Bolivia.

Stage 2. Rich picture, main tasks and issues: For each SH a synthesis of the information collected is shown in Table 1.

Table 1: Tasks and issues in CNP management (SERNAP a, 2005)

- Illegal hunting and fishining
- Existing infrastructure in PA (roads, buildings, etc.)
- Occupation of green communal areas in PA
- Land tenure in the BZ
- Plan of management needs to be updated, to be finished or to be approved
- Land tenure within PA boudary
- Illegal extraction of timber from PA
- Insufficient or inexistent social participation in the management of PA
- Illegal human settlements within PA
- Conflicts between gamekeepers and farmers in PA, and fauna
- Conflicts between legal settlements and illegal settlements
- Cutting and clearing communal areas in PA
- Unclear status of environmental services (access to water)
- Conflict between municipality authorities because of unclear PA and BZ boundaries
- Illegal activities like production and traffic of coca leaves
- Unclear administration and management of PA
- Increasing of agricultural frontier in harming PA and BZ
- Environmental negative impact because of infrastructure and tourism facilities and activities
- Landowners sell more property that they own, creating spatial, social, and economic problems
- Gamekeepers under risk or hazards from illegal settlements, wood cutting, etc.
- Communal land use practices not appropriate in PA (burning and slashing)

Stage 3. Comparison of conceptual Model with Rich Picture, relevant systems: The next step is to formulate root definitions for relevant sub-systems of the overall human activities systems (HAS) identified at the previous stage. Emerging sub-systems developed from the predefined tasks, or perceived as having an influence on these tasks were identified. At this stage, root definitions provide a platform for focusing on the whole context rather than discipline oriented technical solutions (Hjortsø, 2002). The overall HAS was defined by human activities performed within the boundary of CNP and its BZ. Within the boundary a sub-system was the CNP organization. This sub-system included other third-order systems, such as PA management system, and within this system the specific short-term planning activities constitute a fourth-order subsystem. Within the short-term planning sub-system a fifth-order sub-system was defined as a "protected area management" (Fig 1).

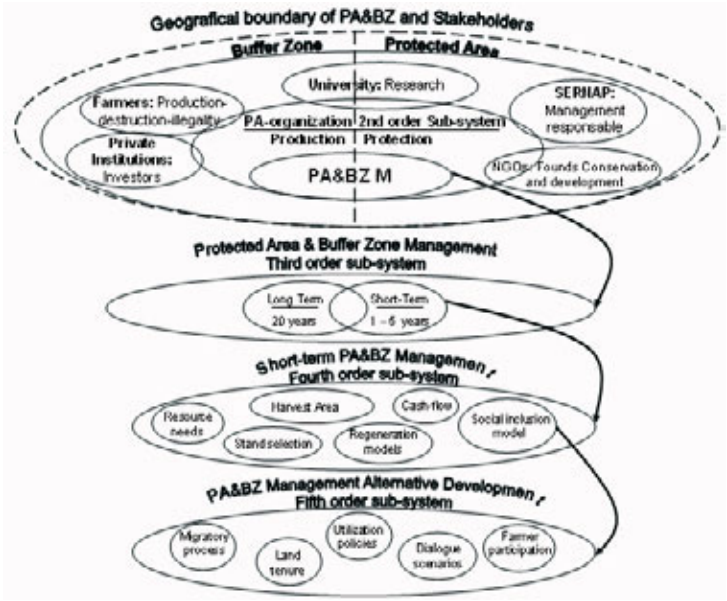

Figure. 1: The figure illustrates the systemic perspective applied in the case study (From Hjortsø et al., 2005a)

The possible (issue based system) root definition of the PA management (PAM) identified is illustrated in CATWOE. The process of formulating root definitions and the use of CATWOE are very useful in providing a venue for open analysis and assumption surfacing, and show the dual focus on CNP's need for a PAM on the one hand, and enhancement of community development through participatory local involvement on the other hand (Hjortsø et al., 2005a). The latter is expressed in the root definitions for a sub-system to develop new PAM alternatives as follows:

CATWOE:

Customers: MMTC (Association of Municipalities of Tropics of Cochabamba) municipalities and farmers; government (SERNAP); NGOs; private institutions

Actors: MMTC (municipalities and farmers), government (SERNAP), and researchers

Transformation process: A process of establishment and management of PA and BZ without social participation —Sustainable management of PA and BZ in which both nature conservation and development of the region are supported by social participation

Weltanschauung (world view): A PA and BZ that contributes positively to the household economy throughout its sustainable management including social participation in the establishment and management plan

Owners: Government, MMTC

Environmental constraints: The social and political situation in Bolivia in the last 30 years was uncertainty; the budget for the management of PA; the unclear technical terminology used for PAs and BZs zoning functions.

Stage 4. Conceptual models:

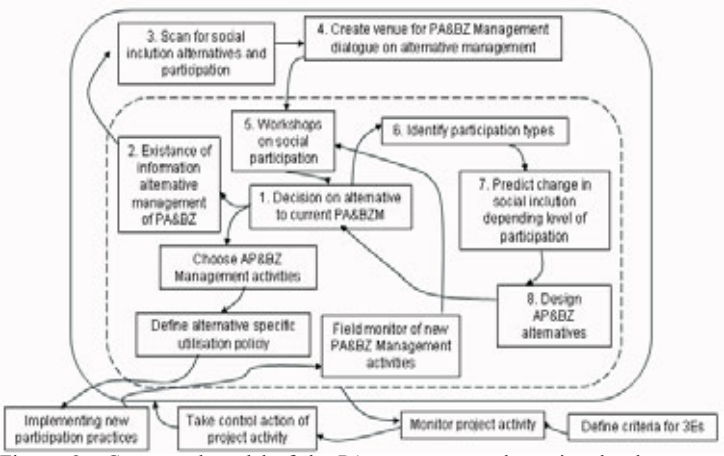

Figure. 2: Conceptual model of the PA management alternative development system defined in CATWOE (From Hjortsø et al., 2005a)

Based on the transformation process defined in the root definition (CATWOE), the inputs and activities which allow the transformation process to take place, a model was included according to the previous knowledge and literature review. In order to make a realistic and robust system, the exercise to accommodate the different interests based on the available data was difficult. The modelling process concerned with the root definition in CATWOE converged to the conceptual model shown in Fig 2.

Stage 5. Comparison of conceptual model with Rich Picture. In this brief comparison oriented toward local participation within the PAM, the literature reviewed due to the problem situation approached (background) plays a fundamental role, since no participatory survey method (e.g. cognitive mapping) was applied. The balance of the logic-based and cultural analysis streams established by the methodology (Checkland, 1981), is an important task to consider in this comparison. Since no interlocutor or interviewer is participating directly in this research, the presumptions formulated at stage 1 based on the literature reviewed are the reference to make such a theoretical comparison. Following this and taking the presumption related to lack of social and local participation on the design, establishment, and management of PAs as example, it is possible to say that the local participation in CNP is partial and hardly managed by the authorities of CNP and SERNAP. The activities oriented to improve not just the number of meetings but also the activities oriented to measure the effectiveness and efficiency of local participation must be implemented, and the fulfilling of objectives formulated in the PAM in this respect must be monitored constantly by a committee representing by all the stakeholders involved in the PAM.

Activity in Model	Exist?	How it is done?	Who? Good/Bad (Criteria to judge)	Alternatives? Comments?
1. Decision on alternative to current PAM	Partly	Establishing calendar for meetings between farmers and SERNAP authorities to analyze the situation.	The efficiency and effectiveness of the achieved results at the meetings based on fulfilling the objectives proposed	Meetings are a kind of formalism needed to SERNAP justify its activities in the area
2. Existence of information alternative management of PAM	Yes	There is relevant information cumulated mainly from meetings between farmers and municipalities, and reports from SERNAP are available.	Researchers calculate quantity and quality of information available. If they consider enough quantity and quality they can improve the process	Even if the information exists and is available, it should be important to verify the reliability and source Collect data from all SHs involved in the management of CNP
3. Scan for social inclution alternatives and participation	No	Establishing activities to monitor and evaluate social participation.	Researchers have to establish parameters needed to evaluate and monitor	It is possible to abolish parameters because the difficulty

Figure 3 Part of the output comparison stage in CNP management alternative development system

The comparison stage is one of the steps before starting the debate with people and then the implementation of the agreements achieved (stages 6 and 7 in checkland's methodology). To open the possibilities and to handle the potential building scenarios of dialogue throughout this step is crucial to the ongoing discussions, maintain a balance between the cultural analysis and logic based analysis streams mentioned before.

Discussion and conclusion

About PAM and case study

The unclear definitions of the PA and BZ concepts and terminology affect the efficiency and effectiveness of PAs management in Bolivia, which is especially sensitive in the case of CNP (Pauqet, 2005) because of the dynamic and changing social, political, and economic situation in the study area. Another aspect which is considered relevant to this research is the need to define the zoning functions between PAs and BZs in the field, working with the communities, improving and promoting the local participation. At the beginning of 2006 the official literature reports the exceptional case of Cotapata and Cordillera de Sama Biological reserves (SERNAP, 2005a), the two first biological reserves in Bolivia with a participatory management plan including the local participation of communities. Nonetheless, there are many other several conflicts reported in the management of PAs (showed in Table 1) which are common in all PAs in Bolivia, which shows structural deficiencies in the SNAP (eg. insufficient budget). A mere 3% of the total budget for the management of the 22 PAs is provided by the Bolivian government, the other 97% is supplied by international donors. As Danielsen et al. (2000) affirm for developing countries in particular, where money and human capacity are scarce, the biodiversity monitoring and management systems should be based on locally available capacity to be sustainable. In the case of Bolivia this principle is far from being achieved, especially taking into account the fact that PAs management is a long-term commitment in terms of social, economic and environmental impact (Fortes, 1999; Jackson, 2000).

This research has focused upon the analysis of local participation in the management of PAs because it is considered one of the main aspects for the sustainable management of

PAs (Pacheco & Kaimowitz, 1998; Pyhala, 2002; de Oliveira, 2005). On one hand SERNAP has prioritized the participation of local communities settled within and around PAs which is going to contribute to the sustainable management of PAs, but on the other hand, SERNAP should be aware that this process, according with some authors like Borrini-Feyerabend (2004) takes a long-term view.

About the methodology applied

As Matthews et al. (2003) affirm, SSM is not only a methodology to structure a problem situation like the case of CNP management but also a flexible tool per se, considering on one hand its cyclical analysis and on the other, its capacity to combine the analysis with different techniques and tools like Participatory Rural Appraisal (PRA) or Geographical Information Systems (GIS) which provide a flexible analytical framework where the trade-off between social, economic and environmental impacts can be evaluated. This is particularly useful in the case of complex problem situations like the case study in CNP, in which SSM was useful in helping to structure the main issues around PAs in Bolivia and the different perspectives of different SHs in a systematic and systemic approach.

The possibility to visualize the field work stage and to structured the problem situation as an office-analysis before a field work stage using SSM, is a good pre-practice action which can contribute to take better future decisions, helping the stakeholder analysis, establishing a preliminary list of key contact and key informant people, and also contributing to make better use of economic sources and time schedule improving the logistic of the survey.

This research does not offer a ready-made formula for PAs and BZs managing. Rather it seeks to contribute directly to improve the problem identification and structuring in the case of CNP using SSM as and "office-based" analysis (Warner, 2000). As mentioned in the introductory section, a field work stage must be developed applying before the full version of SSM methodology, which is the application of Checkland's stages 6 and 7.

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