Assessing Participatory Geographic Information Systems for Community Forestry Planning in Cameroon: A Local Governance Perspective

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February 2003

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By

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Thesis submitted to the International Institute for Geo-information Science and Earth Observation in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation, Planning and Coordination in Natural Resource Management.

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To my beloved mother **Lilian Nkumeh Minang**

And

My late Father **John Akumbu Minang**

Acknowledgements

The brief scientific journey that has produced this thesis has seen the contribution of seasoned scientists, family, friends and institutions. Without them, I wonder whether this adventure of mine would have yielded any fruits. I will like to express my sincere gratitude to you all.

I am most grateful and will be eternally, to my supervisors Dr Mike McCall and Dr Ing. WHE de Man for their patience and invaluable guidance into the world of science. Words cannot express what I have learnt from them within and outside this research.

I owe many thanks to the all staff of the PGM department (Social Science) of ITC especially to my adviser Dr van de Zee, Drs Jeroen Verplanke for his guidance during the early phases of my thesis work and to Drs Emile Dopheide for his useful suggestions at different stages of my research.

Special thanks go to Jacqueline van de Pol of Global Forest Watch Yaounde, for her support during my fieldwork; Miriam van Heist of CGIAR, Eli Hakizuwami of IUCN Yaounde and Dr Laurent Sedogo for the mind searching discussions and exchanges we had on the subject of PGIS.

Without the cooperation of the Tinto and Bimbia Bonadikombo communities, I do not think this study would have seen the light of day. The Bimbia Bonadikombo Natural Resource Management Committee, Tinto Clan Community Forest Common Initiative Group through their managers Messrs Makaka Ludwig Manga Williams and Eyang Tanyi were exceptionally helpful. I will also like to acknowledge the staff of the Regional Centre for Development and Conservation (RCDC) Limbe, The Limbe Botanic Garden, Ex Mount Cameroon Project Staff and the Living Earth Cameroon staff, especially Nemoh Egbe, Julie Fawoh, Nsoyuni Lawrence, Tekwe Charles, Richard Molua, Ntube Grace and Hon Gwendolyne Burnley. Without them the fieldwork would not have been possible, thank you.

I will be unfair to my conscience if I fail to acknowledge the warmth of my course mates through the 18 months at ITC. My cluster friends Wubshet, Mavuto, Andrew, Diane and Enver have been exceptional “we remain united”.

Hearty thanks go to the Tontu, Welang, Nkwi, Yondo, Mukong and Wuwih families, my brothers and sisters; Togho, Ngang, Ndi, Zik, Anguh, Viban, Vikesi, Wekocho, Nyingmah, friends; Fon, Afue, Mor-Achankap, Agoons, Epale, Tamanjong, Momo, Din, Yu, Neba, Yemefack, for all the support.

My mum has just been a wonderful source of inspiration in my life and I think the thesis is hers.

Finally I like to thank all the good people at ITC and the Dutch Government for financing my studies at ITC.

List of Abbreviations and Acronyms

API	Aerial Photo Interpretation
BB	Bimbia Bonadikombo
BBNRMC	Bimbia Bonadikombo Natural Resource Management Committee
CBM	Community Based Mapping (Actual mapping activities)
CDC	Cameroon Development Corporation
CF	Community Forest
CF PGIS	Community Forestry Participatory Geographic Information System
CFU	Community Forestry Unit (Unit in charge of CF in MINEF)
CFWP	Chief of Forestry and Wildlife Post
FUG	Forest User Group
FGD	Focus Group Discussion
GI	Geographic Information
GIT	Geographic Information Technologies
ISK	Indigenous Spatial Knowledge
JICA	Japanese International Cooperation Agency
LE	Living Earth
MC	Management Committee
MCP	Mount Cameroon Project
MINEF	Ministry of Environment and Forests
M&E	Monitoring and Evaluation
MoP	Manual of Procedures and Norms for the acquisition and Management of Community Forests
NIC	National Institute for Cartography (National Mapping Organisation)
NFSD	Nestle Foundation for Sustainable Development
NTFP	Non Timber Forest Products
PSP	Participatory Spatial Planning
PDA	Personal Digital Assistant
PGIS	Participatory Geographic Information Systems (Includes CBM, Participatory tools and GI use in the process)
PRA	Participatory Rural Appraisal
RCDC	Regional Center for Development and Conservation
SSI	Semi Structured Interview
SFM	Sustainable Forest Management
TCCF_CIG	Tinto Clan Community Forest Common Initiative Group
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
VARCIG	Victoria Area Rainforest Common Initiative Group
VLFCC	Victoria Lands and Forest Conservation Committee

Abstract

There is a widely held assumption that participatory approaches including Participatory Geographic Information systems (PGIS) promote good governance. The Community Forest (CF) development policy in Cameroon, based on this assumption has introduced Community Based Mapping (CBM). Generally CBM involves the use of Geographic Information Technologies (GIT). The Ministry of Environment and Forests (MINEF) assumes that when the "community" is involved in the mapping of the intended community forest this can improve forest management, specifically enhancing forest sustainability. Involving local communities in managing "their" resources fits within the approach of good governance. This study therefore critically assesses CBM for CF in Cameroon as an example of PGIS from a local governance perspective. It points out whether or not and how these assumptions hold true in practice. The study does this by describing the PGIS process in CF in terms of actors, inputs, processes and outputs, assessing the extents to which PGIS outputs satisfy actor geo-information needs for CF planning in Cameroon, examining how the PGIS process promotes good governance participation aspects in forest resource management, and identifying and describing the factors that influence PGIS in CF. Two criteria sets have been used, one for assessing the Geographic Information (GI) outputs in terms of effectiveness in meeting the geo-information planning needs of different actors and another for the evaluation of participatory aspects of good governance in the PGIS process. Two cases in the South West Province of Cameroon are used in this study: Tinto, a mainly rural homogenous community, and Bimbia Bonadikombo, a peri-urban community. Participatory tools including semi-structured interviews, participatory diagramming and focus group discussions were used in the data collection. Actor Oriented methodology has been used in the analysis of the primary and secondary data collected. The description of the PGIS for both communities revealed that both communities adopted broad community land use planning at the beginning and later narrowed into specific CF management planning. The main outputs were found to meet between half and a third of the actor GI needs. The outputs also represented some local spatial knowledge. Evidence suggests that the outputs have limited legal recognition and benefit from little trust at higher-levels in the MINEF. However, actor involvement in PGIS was found to be driving forward the institutionalisation of these outputs at the local level. A plethora of interrelated forces was found to influence the PGIS trajectory, including CF policy, the degree of community organisation, local land and resource tenure provisions, history of relationships between actors, NGO facilitation and the availability of resources. The study found that PGIS promoted good governance by adhering to and subscribing to different levels of participation including decision-making, empowerment and the mobilization of a previously divided community to make land use planning decisions beyond CF and initiating action towards reclaiming land on lease to a state corporation. It was also found that PGIS promotes good governance by positively improving communication and dialogue, redressing forest resource access and control rights through joint decision-making, actor empowerment through training, local knowledge recognition and use and the exposure to different levels of analysis using GI.

Keywords: Community Forestry, Community Based Mapping, Participatory Geographic Information Systems, Good Governance and Participation.

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1. Introduction

This research is about assessing Participatory Geographic Information Systems (PGIS) for community forest (CF) planning in Cameroon using good governance dimensions. The research focuses on whether or not, and how, the PGIS process, and its Geographic Information (GI) outputs (maps, etc) meet good governance dimensions. The assessment is done in the community forestry-planning context in Cameroon wherein PGIS has been used, thus it focuses on the governance interests of the local communities and to a limited extent the interests of the Ministry of Environment and Forests (MINEF). Two case studies, Tinto and Bimbia Bonadikombo, are used.

In this chapter the research context and problem are introduced, followed by specification of the research objectives, research questions and conceptual framework of the study. The chapter ends with a description of the structure of the thesis.

1.1. Evolving community forest policy in Cameroon

Following a decades old annual deforestation rate of 0.6% (FAO, 2000), growing disincentive for voluntary conservation of forests by communities (Moniaga, 1986 cited in(Chi, 1999) and considerable advocacy from civil society and Breton Woods institutions, the government embarked on forest sector reforms back in 1991 aiming mainly at involving all stakeholders in forest management. This resulted in the promulgation of a law on the environment, forests, wildlife and fisheries in January 1994. One main feature that reflected the overall goal of the reforms was the introduction of the concept of community forestry. Extant forest law (January 1994) defines a Community Forest as:

"That part of non-permanent forest estate[1] (not more than 5000ha) that is the object of an agreement between government and a community in which communities undertake sustainable forest management for a period of 25 years renewable"

CF has since gained considerable attention from many communities in the forest zone and also attracted tremendous support from the international donor community. (Brown, 2002) reports that by the end of 2001 the unit in charge of community forestry in the Ministry of Environment and Forests (MINEF) had received 138 applications for community forests. This support has been mainly due to the fact that it is seen as a potentially strong means of improving local governance through greater community participation and the integration of valuable indigenous management practices in sustainable forest management, if well done. Furthermore, it has tremendous potential to provide direct benefits to communities, some in the form of cash that could be ploughed back into community development projects.

[1] Defined as all non-protected forests areas (MINEF 1998).

1.2. PGIS for planning and managing community forestry in Cameroon

A Manual of Procedures for the acquisition and norms for the management of community forests, (MoP) developed by the MINEF, enumerates the following geo-information related conditions to be met by communities in order to be granted a community forest (MINEF, 1998);

►Producing a map showing clearly the boundaries of the intended community forest,

►Providing a clear description of activities previously carried out in the proposed community forest area,

►An inventory report of the community forest resources and

►A management plan in which the forest is zoned into five-year exploitation compartments.

Although only the first requirement has been explicitly requested in the form of a map, most communities have chosen to present the remaining three in maps. This makes geo-information tools in all forms a compelling requirement in the community forest planning and management process. Granted that the maps are supposed to show clearly how the communities intend to use the forest, the law also requires that the process of making them should be participatory.

In the past six years, with the support of NGOs, communities have been involved in "participatory" mapping processes in the community forestry planning process, attempting to incorporate GIS and other GIT. The processes, breadth and depth of facilitation, extent of participation, ownership, access, and community control and resources used have obviously been different between projects. For most communities and facilitating institutions it was the first encounter with GIS. The tool use ranges from participatory sketch mapping, manual transparent overlays on topographic sheets, aerial photo interpretation, GPS or Compass surveys and GIS.

The use of both participatory tools and the involvement of people in the use of GIS tools qualify these experiences as a form of PGIS.

This study assesses two of these CF PGIS experiences in terms of good governance dimensions. It looks at whether or not and how CF PGIS processes promote good governance, the extent to which the outputs satisfy actor geo-information objectives and the forces influencing the trajectory of PGIS processes. The forces influencing the trajectory of PGIS are studied in this instance because they impact on the dynamics of the process and as such influence PGIS capability to promote governance.

1.3. Participatory Geographic Information Systems and Good Governance

> "There is an implicit, sometimes explicit assumption that GIS at the local level is both efficient and effective, in that it is believed to simultaneously meet the content needs, answer the questions asked of the geo-information, and address and satisfy the local stakeholders' underlying interests. As such there is an often-made assumption that

PGIS is a tool for better governance"(McCall, 2002a). This view has also been expressed in (Alcorn, 2000; Carver, 2001).

Given that the assessment of CF PGIS in this study is based on good governance indicators, it is necessary to establish common understanding of the concept before fully stating the research problem.

Governance is a concept that may be as old as human civilization; therefore, one will not expect a universal view or definition for it.

McCall, (2002b) describes governance as "a set of measures of the relationships between the public (civil society/citizens) and its government, and (to a lesser extent) private sector capital".

Gaventa and Valderrama, (1999) cite a more prescriptive meaning given to governance by Minogue as follows: "both a broad reform strategy, and a particular set of initiatives to strengthen the institutions of civil society with the objective of making government more accountable, more open and transparent, and more democratic".

Other more government-focused views include one by (JICA, 1995) "whether governments achieve their stated objectives effectively and efficiently" and (NFSD, 2002) "governance is the art of public leadership". The NFSD definition further specifies three distinct dimensions namely, the form of political regime, the process by which authority is exercised in the management of a country's economic and social resource, and the capacity of governments to design, formulate and implement policies and discharge functions.

UNDP, (1997b)defines the core characteristics of good governance as: Participation; Rule of law; Transparency; Accountability, Legitimacy, Responsiveness; Consensus-orientation; Equity; Effectiveness and efficiency; Resource Prudence; Strategic Vision; Ecological Soundness; partnership; Empowering and Enabling; Spatially grounded in communities.

However, a more process-focused definition is one given by (UNESCAP, 2001): viz the process of decision-making and the process by which decisions are implemented (or not implemented).

The UNESCAP definition in the preceding sentence seems to be most appropriate for the purpose of this research. The reasons for this are as follows: firstly it seems to sufficiently highlight (though not the only definition that highlights) the process of decision making as important. With participatory mapping being a spatial planning and decision support tool, its outputs can be considered visual representations of the decisions.

Community forestry PGIS in Cameroon enables local forest use allocation and forest use decisions. This involves delineation of boundaries and use areas. These land use decisions deal with many actors, interests, and complex tenure arrangements and imply changes in access and control rights. CF PGIS is therefore a multi-actor and polycentric decision-making and implementation environment. This implies that any meaningful decisions must be arrived at through a participatory process. Therefore, CF PGIS must be practical, accessible, cheap, responsive to these needs and flexible enough for the multi-actor interaction in the decision-making process. The requirements in the preceding sentences all translate into good governance elements of accountability, legitimacy, equity, respect for rights, laws and indigenous

knowledge, competence, effectiveness, efficiency, strategic vision, partnership, resource prudence, consensus-orientation, transparency, responsiveness and empowerment.

1.4. The Research Problem

CF PGIS experiences in Cameroon and local resource management experiences in other countries reported hitherto (Gonzalez, 2000; Jordan, 2002; Kwaku-Kyem, 2002; Lescuyer et al., 2001; Sirait et al., 1994) have not been critically reviewed in terms of the their role in promoting good governance.

Local PGIS experiences reported in southern countries, have thus been evaluated mainly in terms of technical performance, leaving many participation and process related issues unattended (King, 2002). Examples of such issues fall within the governance dimensions mentioned in the preceding section; they include effectiveness of participation, equity, transparency, legitimacy, inclusion of local knowledge, and whether or not the PGIS outputs meet the interests of the actors involved. Moreover, most of the PGIS experiences have been within development projects attempting to link communities with geographic information systems in the area of natural resources management and agriculture with a given time frame. Viewed from a participation perspective these short periods will contradict sharply with the characteristic long periods required for proper actor involvement (Catley, 1999; King, 2002; McCall, 2002c; Musch, 2001). They have also been highly driven by project objectives and as a result not been able to give as much resources and attention to participation and process dynamics.

Those relatively neglected PGIS output and process effectiveness and efficiency issues are examined from a governance perspective in this study. It involves an assessment of the effectiveness and efficiency of the systems in the light of planning, participation and good governance. This is the research gap that this study hopes to contribute to narrowing.

This study assesses two PGIS experiences from Cameroon. These cases, unlike those referred to above, are applications that are not experimental in character, and they lasted between 3 and 7 years each. This research gives a critical look at the PGIS processes, finding out what has worked and what has not worked, and makes suggestions on how they could be improved. Specific attention is given to participation as an important aspect of governance in the PGIS processes.

Within a limited time and resources, this research focuses on assessing the participation dimensions of good governance in the CF PGIS process, the extent to which the outputs satisfy actor geo-information objectives, and the forces influencing on the PGIS process.

1.5. Objectives and Research Questions

The overall objective of this study is:

To assess PGIS for community forestry planning in Cameroon using good governance dimensions.

Specific objectives and research questions are provided in Table 1.1.

Table 1.1: Specific Objectives and Research Questions

Objectives	Research Questions
1) To describe the PGIS process used in community forestry planning for two cases in Cameroon.	1) What are the main elements of the PGIS process? 2) How can the main elements of PGIS be structured or conceptually modelled?
2) To examine the extent to which the CF PGIS outputs satisfy the actors' geo-information needs in the two cases.	3) What are the actor geo-information needs for community forestry planning? 4) How do these outputs satisfy the actor-information needs?
3) To identify and describe the factors influencing PGIS for CF in Cameroon.	5) How does the MINEF geo-information structure influence PGIS? 6) What other external factors influence PGIS process and output?
4) To examine whether or not and how CF PGIS promotes good governance dimensions in forest resources management.	7) How does participation in the CF PGIS process perform against process indicators of good governance? 8) How do other PGIS components relate to other good governance indicators?

1.6. Conceptual Framework

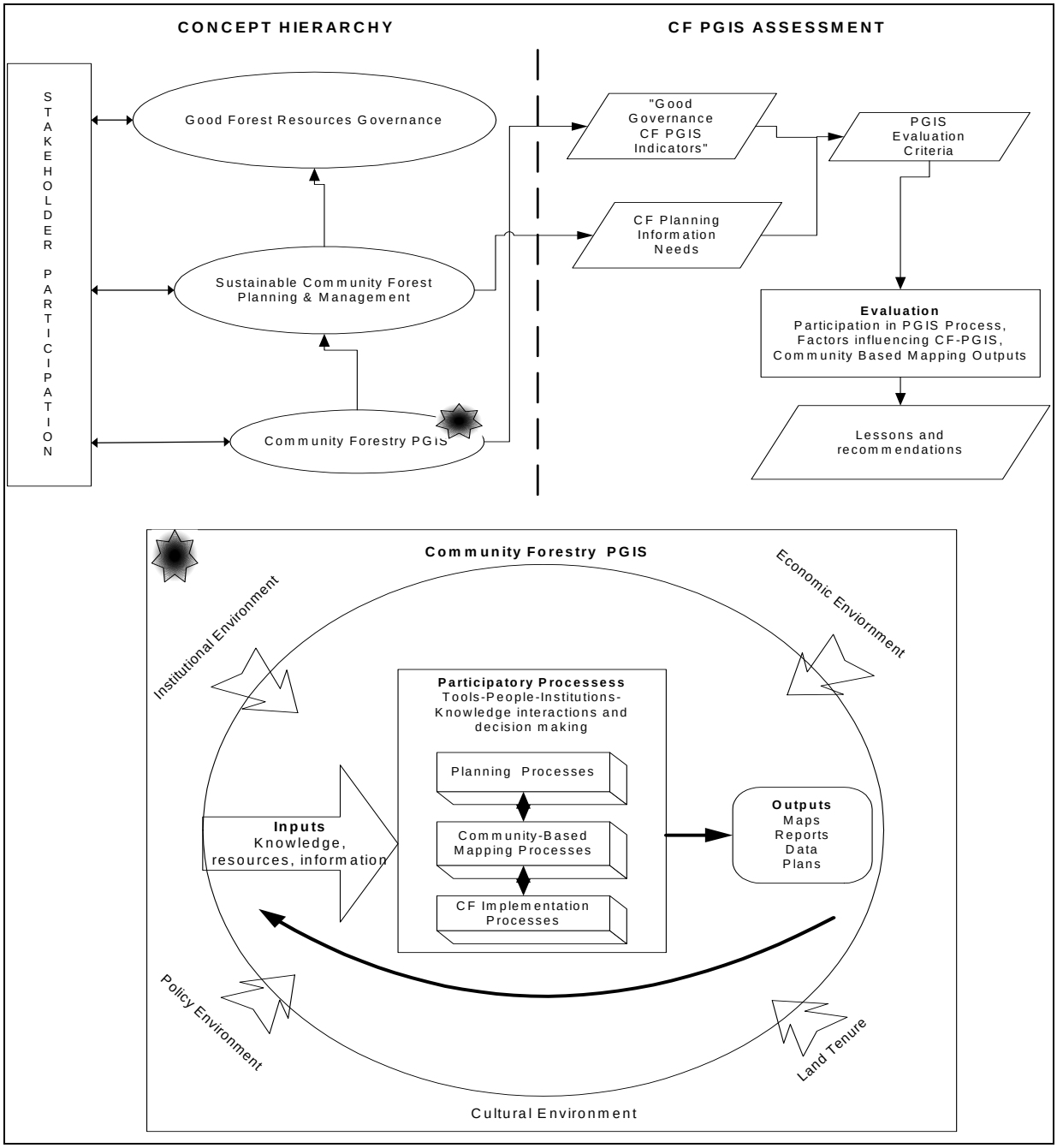

Figure 1.1 Conceptual Framework of the study

Figure 1.1 shows to the top left, the main assumption of the study. The principal assumption in this study is that PGIS can promote good governance if genuine participation prevails. In the concept hierarchy, community forestry PGIS contributes to sustainable CF planning and management and consequently sustainable CF planning and management contributes to good forest resources governance. Improving one micro level or a part will therefore improve the higher level and cumulatively the highest level of good forest resource governance. This chain of consequences is contingent on the prevalence of genuine participation at all levels in decision-making processes.

This research assesses CF PGIS processes in two cases in Cameroon to find out the extent to which these assumptions hold true.
The assessment (as shown top right) of the process is based on a governance perspective, using good governance indicators. The output assessment on the other hand, is based mainly on whether they meet the CF geo-information planning needs.
The Community Forestry PGIS system (framed inset) is the core of this study. It is composed of inputs, processes, outputs and the system environment. There is a very strong link between the components as shown in the framework flows.

1.7. Justification

This study should contribute to narrowing a gap in scientific explanation and understanding of how (structural rather than experimental) PGIS promotes good governance, especially in the area of community forestry.

This research should help identify good practice for the promotion of good governance through PGIS and its findings will be valuable in shaping future CF PGIS processes in Cameroon. The lessons could help NGOs and resource persons acting as facilitators of participatory natural resource mapping processes. It is the hope of the researcher that the findings could contribute to the current CF policy reform debate.

1.8. The structure of the thesis

1.8.1. Chapter 2: Review of related literature

Chapter two explains the theoretical foundation of this study, by reviewing and commenting on the literature on the place of CBM in resource planning, the concept of PGIS, natural resource and forestry applications of PGIS, and good governance dimensions and indicators.

1.8.2. Chapter 3: Research Methods

This chapter is a narration of how the research was conducted. It specifies the case study approach adopted for this study and how actor oriented methodology principles influence the analysis of the cases. The study areas are presented and further explanation is given on methods, tools and techniques including Semi-Structured Interviews (SSIs), Focus Group Discussions (FGDs), participatory diagramming and coding, as applied to the field data collection and analysis. It also presents succinctly the PGIS assessment framework used in this study.

1.8.3. Chapter 4: Results

The chapter presents the finding of this study in terms of the four research objectives (Table 1.1). It begins with detailed descriptions of the PGISystems of both communities, followed by the results of the assessment of both cases based on the indicators for geo-information outputs, and good governance in the process, as per the evaluation framework. Lastly, the factors that influence the trajectory of the PGIS are described.

1.8.4. Chapter 5: Discussion

This chapter presents a comparative analysis of both community PGIS and an analysis of the interface between community PGIS and the higher levels of the MINEF. The emerging issues and differences in terms of good governance are highlighted, explained and commented upon. This chapter is relevant to objectives 2,3 and 4 (Table 1.1).

1.8.5. Chapter 6: Conclusions and Recommendations

In this chapter the lessons learnt from the analyses of the case studies are presented as conclusions and recommendations for the improvement of PGIS for CF planning in Cameroon and further research. These are presented for all research objectives.

2. Review of Related Literature

This chapter reviews relevant PGIS forestry related literature from developing country contexts as well as GG literature. It also establishes the basis for PGIS GG indicators that constitute the assessment framework for this study and situates the current research within this broad PGIS research context. However, the chapter begins by briefly looking at community based mapping and PGIS.

2.1. Community Based Mapping

Community Based Mapping (also referred to as participatory mapping) has received great attention in recent years as a tool for involving local people in development and planning projects (Alcorn, 2000; King, 2002). CBM constitutes a process in which local actors create representations of local knowledge of space engaging in analysis of objects, relationships and issues. The tool belongs to a family of tools called Participatory Rural Appraisal (PRA). PRA grew out of a group of methods called Rapid Rural Appraisal developed in the 1970s to challenge the top-down development approaches and methodologies that tended to ignore local knowledge and participation. The PRA approach has been identified as an approach that enables communities to learn more about their environment, better organize information, plan and take necessary development action (FAO, 1995). This implies intensive involvement in analysis, mediating, sharing knowledge (between local persons and with external agents) and empowerment when and where decisions are made and action initiated. These characteristics have fuelled increasing recognition and the growth of CBM or participatory mapping as an approach to spatial planning. This increased popularity has also allowed for an evolution in CBM.

Specifically CBM processes have moved from using basic sketch maps to a range of technologies including GPS, compasses, three-dimensional modelling, photo-mapping GIS based maps, RS Image interpretation, mobile GIS utilising a PDA and all kinds of multi-media graphics software in visualization (Alcorn, 2000; Gonzalez, 2000; McCall, 2002c). The recent inclusion of GIT in CBM has met with great application interest in the GIS community. Tangentially research interest has risen in trying to look at how participation works with relatively high technology such as GIT (Abbot et al., 1998; Carver, 2001; Jordan, 1999; King, 2002) in spatial planning processes.

This study is about Community Based Mapping processes using GIT. Reference to CBM in this study will therefore imply a process in which local actors create representations of local knowledge of space engaging in analysis of objects, relationships and issues.

2.2. *Participatory Geographic Information Systems* (PGIS)

Participatory Geographic Information Systems (PGIS) is a subject that has developed out of a debate between pro-technology GIS scientists and social science critics of GIS used at local level by non-professionals over the last decade (Carver, 2001; Craig et al., 2002; Obermeyer, 1998) As GIS gained popularity as a mainstream tool for the organisation, analysis and representation of geographic information for decision-making, social scientists criticised it for being top-down, complex and inaccessible as a tool designed to facilitate decision-making. GIS thus had to respond to the demands of a society where democracy, good governance and public participation were key to planning and decision-making. As the debate developed, scholars, professionals and users of GIS have developed a variety of approaches to making GIS and other spatial decision-making tools available and accessible to all those with a stake in decisions. Such approaches have been referred to as PGIS (Schroeder 1997 in ((Obermeyer, 1998).

Abbot et al., (1998) refer to PGIS in developing country context as "an attempt to utilise GIS technology in the context of the needs and capabilities of communities that will be involved with, and affected by development projects and programmes". Other probing ideas of the subject include incorporating community participation into a GIS, the social-behavioural implications of GIS and broadly the inter-relationship between GIS and society (Craig et al., 2002; Nyerges et al., 2002; Obermeyer, 1998). (Jordan, 1999) simply refers to PGIS as "the use of GIS in a participatory context". PGIS has also been variously called Public Participation Geographic Information Systems (PPGIS) and Community-Integrated GIS (Harris and Weiner, 1998).

Its application is growing in planning and management contexts where geographical space is an important factor in decision-making. Planning, natural resource management and industry are examples of areas with increasing applications of PGIS concepts. More specifically, it has been used at local level to enhance mapping for land claims, knowing, using and managing natural resources, managing conflicts, mapping equity, inequalities and building communities through awareness raising, institutional strengthening and empowerment (McCall, 2002a; Poole, 1995). Alcorn, (2000)highlights the uses and potentials of PGIS in "grassroots-based advocacy", helping to catalyse changes in policy and management at all levels. These uses and the potential for promoting good governance continue to spur communities, NGOs and governments to use PGIS in natural resource management. This in part contributed to the adoption of PGIS as a planning tool in community forest development in Cameroon.

This research specifically examines the extent to which PGIS processes as applied to community forestry in Cameroon promotes good governance. Reference to PGIS in this study will therefore imply the totality of CBM and GI use and management.

2.3. Relevant Natural Resource / Forestry Related PGIS literature

Albeit a budding subject the growth in literature on natural resource related PGIS has been impressive in recent years. Notable reviews have included (Alcorn, 2000; Carver, 2001; Craig et al., 2002; King, 2002; McCall, 2003). In the ensuing paragraphs, brief pictures of one particularly relevant review and of four cases from Nepal, Indonesia, Ghana and Cameroon are presented to enhance understanding of the sort processes investigated in this study.

2.3.1. Borders, Rules and Governance: Mapping to catalyse changes in policy and management.

Alcorn, (2000) reports on a review of 120 community based mapping experiences around the world. The objectives were to find ways in which maps can be used to catalyse change in policy and governance and to describe the process to be taken in preparing maps that will be of value. She identifies community cohesion and self-actualisation, strengthening resource rights, managing development, policy change, democracy, promoting intra-community cooperation and the reclamation of lost land as objectives or change dimensions that these mapping case were able to contribute to achieving. She outlines an eight-step process / framework to be followed in order to produce maps of good enough value to enable the achievement of governance related objectives. These include, initiation and strategic planning, data needs identification and choice of technologies, training for data collection, data collection, data review, final data compilation, map production and map use.

The study reveals that quite often CBM and PGIS go beyond "action research" into political action, thus changing local, regional and even national resource policy. The power of such a process is only unleashed when the process is led by communities themselves. The paper further notes that transparency; accountability, equity and democracy must come to play in the entire process if such success is to be achieved. The author summarises as follows " the key guiding principle is that the mapping facilitator turns authority and decision-making over to the community so they can direct the mapmaking pencil's trace and the map's use".

2.3.2. A PGIS methodological framework for forest user groups in Nepal

Jordan, (2002)reports on an eight-month experimentation of a participatory GIS methodological framework for forest user groups (FUGs) in Nepal. A model process with slight variations mandated by contextual differences was applied in five communities. It included the following; stakeholder analysis (including FUG identification), information needs analysis, data collection (participatory photo-mapping, a participatory inventory and a global positioning systems survey), analysis (in a project office outside the community) and feedback to the FUGs.

In this Nepal case the participation was limited to deciding what data was to be collected and participating in data collection. Community members participated in participatory photo mapping, participatory inventory and the GPS survey. It mentions that local people were able to interpret and use aerial photographs fairly easily. Evidence suggests that the feedback sessions enhanced dialogue in the process, introducing a sense of involvement and therefore ownership.

2.3.3. Demonstrating a method for mapping customary land-use systems to help resolve land-use and boundary conflicts in East Kalimantan, Indonesia

Sirait et al., (1994)describe the demonstration of a method for mapping customary land-use systems that could be officially recognised by the Indonesian Forest Department as the basis for talks aimed at resolving land-use boundary conflicts. The study involves local community members in Long Uli village in sketch mapping, and interviews aimed at finding out the mi-

gration history of the village and in GPS point data collection. GIS mapping is done using government maps from different departments as base maps in order to compare the government land-use plan to customary forest-tenure boundaries.
Traditional resource management systems were found to be as good as the government protection measures. They were marked by systematic community decision-making cognizant of sustainability. The process was found useful in communicating conflict or overlaps in the customary land tenure perceptions and the state land-use plan. Most specifically it conveyed the local perceptions to government officials in a language they understood. It provided an opportunity to discover the inaccuracies in the official government maps. The methodology found difficulties in understanding the spatial organization of traditional peoples on landscapes. Mapping customary lands was also difficult because perceptions of tenure were very complex and highly overlapping even within the community. They conclude that these maps could form the basis for talks to resolve the conflicts and improve forest management.

2.3.4. Exploratory PGIS for integration of local concerns, experiences and customs into forest management practices in Ghana

Kwaku-Kyem, (2002)reports on an exploratory public participation GIS (PPGIS) that sought to integrate the concerns, experiences and customs of local groups into official forest management practices around forest reserves in the Kofiase community -Ashanti region of Ghana. The process consisted of, detailed stakeholder analysis, the establishment of local collaborative forest management committees, basic training in participatory sketch mapping and PRA, map interpretation and GIS analytical demonstrations for committee members and the implementation of data collection and analysis (Multi-criteria analysis for conflict resolution). Fire hazard, forest accessibility and encroachment maps for the forest were produced.
The Kofiase case in Ghana illustrates a higher level of participation in a spatial GIS environment. In this case the community is involved through the process of data collection, analysis in a spatial environment and decision-making. In exploring all the possibilities in a spatial analysis in a digital environment, the participants were able to focus on real-world images rather than subjective judgement. Evidence suggests that this facilitated discussions, directing dissenting views toward a search for evidence in joint data collection and as such reducing confrontation. By bringing stakeholders to work together for the very first time PGIS laid the foundation for future forest institutions. In this case also, rather than just decide on uses like in the Cameroon case, the multi-criteria analysis in the GIS enabled participants to decide on best options as well as predict the future states of their forest, thereby improving governance through improved capacity for informed decision-making.

2.3.5. Consensus building / Negotiation workshop in Cameroon

Lescuyer et al., (2001)describe the use of scenario maps from different stakeholder perspectives in a consensus building/negotiation workshop to allocate a given forest area for different uses in the Campo Ma'an area in southern Cameroon. The process involved four steps. Firstly a stakeholder analysis and grouping; secondly, the development of pre-mediation GIS based maps emphasising logging, biodiversity conservation, community / agro forestry and maintaining current uses; holding a negotiation workshop in which stakeholders come to agreement on allocation of various uses for the area. A standby GIS computer system regu-

larly modified the maps as the negotiations went on until a final allocation map was produced. The community forest was one unit on the final map. A more accurate map could then be prepared.

The Lescuyer et al case goes a step further in the participation continuum from the Nepal case. It looks at the use of GI and GIS in facilitating negotiation processes in forest use allocation decision-making, a much higher level than involvement in data collection. In this example efforts are made to ensure a balanced representation of all stakeholders in the negotiation process. Evidence shows that a disadvantaged indigenous group, the Bagyeli received special training prior to the negotiations. This helped even the power equation in the negotiation process wherein maps were used in allocation and forest resource use decisions.

This case from Cameroon is different from those in this study in that it is applicable only to the initial land use planning level of CF PGIS and does not get into the specific policy requirements for CF. It is operated under the Forest Management Unit regulations.

2.3.6. Important Issues arising from the PGIS literature

PGIS literature reviewed (Alcorn, 2000; Carver, 2001; Craig et al., 2002; Jordan, 1999; Kwaku-Kyem, 2002; Lescuyer et al., 2001; deMan and Toorn, 2002; Obermeyer, 1998; Sirait et al., 1994) reveals a number of domains or variables including, participation/involvement of all stakeholders, control and decision making, access, ownership and control of information, the inclusion of local knowledge and traditions, dialogue stimulation/enhancement, impact of and on power relations, representativeness of outputs, institutional environment, norms and other traditions ,actor experiences (education, relationships etc) and technical appropriateness of methods (for local use).

These variables are those conditions or aspects that could be weaknesses or strengths in the PGIS process when internal and opportunities or threats to PGIS when external to the process. They constitute those elements and factors that are critical for PGIS processes in terms of promoting good governance.

2.3.6.1. Internal variables (Relating to strengths and weaknesses)

Participation as the Involvement/representation of all stakeholders: This involves looking at all the key actors and their stakes and the relevant tasks or decisions to be made and ensuring that all stakeholders are involved at all levels. This could be direct (popular) or by representation. In case of representation feedback mechanisms are crucial.

Control and decision-making: This deals with the degree of control or decisions that stakeholders have in the process. What kinds of decisions did they make? Is it only a question of consultation by certain experts? This may be compared to participation ladders showing various intensities and purposes of participation (Catley, 1999; McCall, 1998)and involves looking at the roles and responsibilities in PGIS processes. The technological appropriateness is also an important consideration for control and decision-making in a local context.

Access, ownership and control of information: This has to do with whose information is used, who defines how it is stored and the rights of access and control over information. There is the popular question of "who defines the map legend"? This issue addresses this question in part. Some indigenous knowledge about sacred places might be used in a map, in

a given way and there might be restrictions on its use for another purpose. Variations in ease of access, control and ownership for various actors will influence power relations. Can the staff of a facilitating agency that happens to have the map use it for other purposes without expressed authorisation from the community? These are clear dilemmas in participation (Alcorn, 2000; McCall et al., 2003).

The inclusion of local knowledge and traditional institutions: This relates to how the process accommodates local institutions and builds on local knowledge in the process. This would be relevant at all levels. This has to do with integrating the components of working community information systems as well (deMan, 2000). One could also argue that this might also be seen in terms of how much of indigenous knowledge (IK) is reflected in the content of PGIS outputs as well as its impact.

Dialogue stimulation/enhancement: This refers to how much exchange, discussion and consensus building was encouraged in the organization and use of geographic information. Interactions of primary stakeholders and institutions in decision-making are key in this case. Another dimension of this issue could be looking at how much external (higher policy level) information is shared with communities and vice versa.

Impacts of and on power relations: The mere inclusion or exclusion of a disadvantaged / under-privileged group of stakeholders would affect the power distance in natural resources decision-making. It is important at this point to think of not only interactions but also the nature of the interactions such as depth. For example, the special training, coaching and briefing of the Bagyeli indigenous people (pygmies) prior to the PGIS negotiation workshop certainly reduced the decision-making power distance between stakeholders in the Akom II area in Southern Cameroon. Further evidence of this is provided in (Alcorn, 2000; McCall, 2002a; McCall, 2002c; Wollenberg et al., 2002).

Overall the internal variables can be put in two groups: PGIS process elements and Impacts of the PGIS process. The process elements are, participation as the involvement/representation of all stakeholders, control and decision-making, access, ownership and control of information, the inclusion of local knowledge and traditional institutions. Impacts elements are dialogue stimulation and enhancement and influence of and on power relations. This distinction is important because the process elements influence the PGIS functionality whilst the impact is a result of PGIS processes with greater influence on “empowerment” and “strengthening of civil society”

2.3.6.2. External variables (Relating to opportunities and threats)

Institutional Environment: Forest policy, legislation and effectiveness and efficiency of the forestry service can be a serious variable influencing the PGIS process. Does it foster or hinder participation in the PGIS process? There are influences from other facilitating institutions like NGOs and local traditional institutions. The institutional culture and other variables would influence the adoption and use of GIS (deMan, 2000; deMan and van denToorn, 2002).

Norms and other traditions: These are cultural aspects that either inhibit or enhance the community based mapping process. Restrictions on representation and sacred information are concrete examples. Customary land and resource tenure provisions are important factors in

this category. Vandergeest et al in (Sirait et al., 1994), argue that "…local complexes of rights and claims renders boundaries on land and resource use more ambiguous than map-makers and the state land planners assume…"

Specific actor experiences: For developing countries these could be a strong opportunity or threat. High or low literacy, actor exposures to negotiations, actor relationships are among several factors that could influence the effectiveness or efficiency of GIS in terms of good governance through actor participation.

It is worth noting again that the separation or seeming dichotomies of internal and external or strengths, weakness, elements, impacts, threats and opportunities may not be reflected in real world situations. Context is highly important. However, for each case the categories mentioned in this section can emerge given the context. No clear dichotomies exist and there will be relationships of varied strengths in each of these cases.

2.4. Good Governance Dimensions

This study makes use of good governance dimensions to assess PGIS processes. As a corollary, reviewing literature on good governance, PGIS and PGIS experiences was crucial to derive operational indicators of good governance in PGIS.

From good governance literature reviewed (Gaventa and Valderrama, 1999; JICA, 1995; McCall, 2002b; NFSD, 2002; UNDP, 1997a; UNESCAP, 2001) key dimensions are identified and defined. Important ones are legitimacy, respect for rights and indigenous knowledge, equity, accountability and competence. The choice of these few dimensions from long lists put up by various views on governance (see section 1.3) was based on three factors. Firstly, most of the categories proposed can be put under one of the categories in the preceding sentence. Secondly, the time for this study did not allow for a detailed study of all proposed dimensions and a manageable degree of generalisation had to be found to suite the available time. Lastly, those dimensions thought to be suitable for regional and national governance were eliminated.

Legitimacy: "Do geographic (GI) tools support or detract from good governance in Participatory Spatial Planning in terms of representativeness of the regional, ethnic, tribal, class, religious, age, gender interests of the "governed" (van Kersbergen et al in (McCall et al., 2003)? Decision-making power and responsibilities at each level must be legitimate. Representatives of sub-local constituencies should be properly selected in a transparent process in which all stakeholders participate. Legal procedures must also exist to monitor, evaluate and regulate the performance of such representatives. Participation and ownership are key elements in this dimension.

Respect for rights and empowerment: There should be respect for human rights, gender and the law. Land rights, property rights; resource tenure rights, indigenous and religious values or beliefs towards resources must be respected both by the main decision makers and the lo-

cal communities. The law must be implemented without bias. Every stakeholders view must be respected and therefore decision-making must be primarily consensus oriented.
Equity: Good governance demands that every stakeholder be given equal opportunity to contribute to decision-making ("fairplay"). Disadvantaged groups will therefore be given special attention in order to get them to participate for the sake of the common good. Gender, age religion and other sensitivities must be considered. Access to information and resources according to responsibilities is thus an important aspect.
Accountability: Decision makers at the local level have to take into account issues from the sub-local constituencies and institutions as well as give an account to them if and when asked to do so. This implies that decision-making responsibilities must be clear to all and appropriate mechanisms put in place to guarantee that this happens. The sequence and level of involvement of all in the decision-making process should be transparent.

Competence: This implies effectiveness and efficiency of the processes. Processes and institutions produce valid and reliable results for decision making with the best use of resources. Competence will include good coordination and consideration for sustainability issues, that is, a certain degree of predictability. Methods and technologies used have to be appropriate to the users. Communication and actor relationships also constitute important issues in this dimension.

For better understanding, it is necessary to see these elements as intertwined in an actual governance setting at every level. In the literature reviewed, the various papers and institutions had very different issues classified under different dimensions each with very good argument. Determining the optimal categories of dimensions is beyond the scope of this study; therefore the dimensions used above and subsequently in this study are not seen as optimally selected. They represent an appropriate categorisation that is suitable to help in the assessment of PGIS on this study.

2.5. Linking GG and PGIS through indicators

If good governance can be seen in part as coordinated and highly integrated multi-actor and polycentric decision-making, then participation in the process will be a sine qua non. If the direct aim of PGIS is to use GIS in participatory development processes to help improve the way people work together, then, concepts of good governance and participation should appear in PGIS and be linked in any PGIS process.
In order to derive good governance indicators for PGIS, the governance dimensions can be linked to common issues arising from the PGIS experiences (section 2.3.6). The issues arising from PGIS can be related to different good governance dimensions and indicators derived. Table 3.2 shows the final breakdown into operational indicators after the fieldwork.

2.6. This Study

The examination of concepts and experiences in this chapter has laid the theoretical foundation for this study in two ways:
Firstly, enabling the definition of the PGIS assessment framework as presented in section 3.3 where in good governance dimensions of legitimacy, respect for rights and local knowledge, equity, accountability and competence are used in the assessment of the PGIS process. As part of good governance criteria of process effectiveness, the outputs are assessed in the light of the extent to which they meet the GI interests of the actors involved. More specifically, it finds out whether the outputs meet the GI needs of CF actors.

Secondly, the concept of CBM and the PGIS experiences (Alcorn, 2000; Lescuyer et al., 2001; Mbile et al., 2003; Sedogo, 2002; van den Hoek, 1988) and the author's experience helped developed a four-step model for structuring CF Planning PGIS (tables 4.2, 4.4 and 5.1).

Thirdly, it helped to provide a perspective for assessing the factors influencing CF PGIS (Objective 3)

3. Research Methods

In order to assess the extent to which PGIS promotes good governance a number of social science tools were used. The research process and the battery of methods and techniques used for specific tasks in this study as well as the relationships between them is shown in figure 3.1. The process has been grouped into three phases namely, the pre-field, field and post-fieldwork.

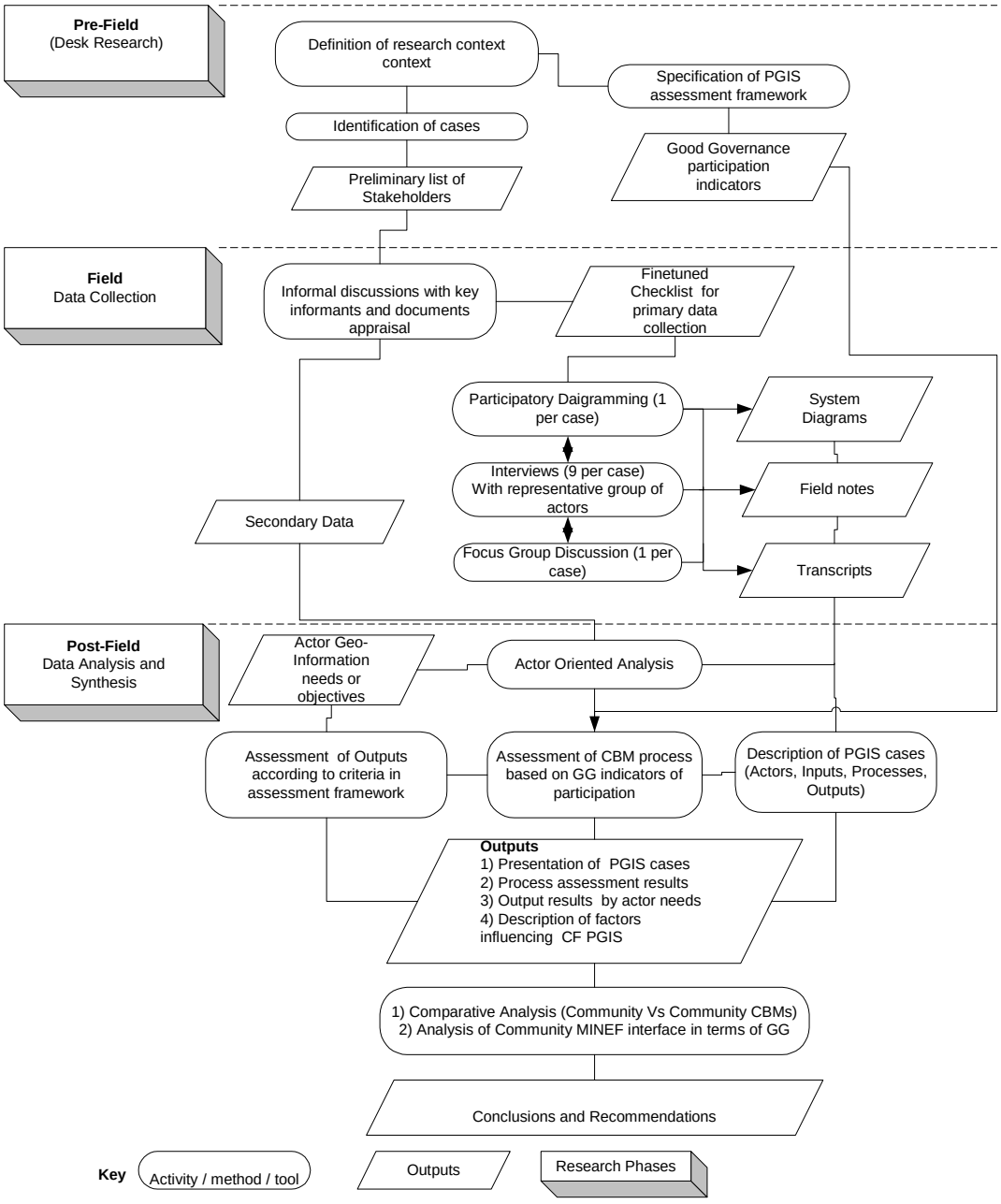

Figure 3.1: Overview of the Research Process

Figure 3.1 shows that during the pre-field phase, the CF PGIS evaluation framework was defined mainly through desk research. In the field, the evaluation framework was refined through review of documents and discussions with key resource persons. Primary data collection was done mainly through semi-structured interviews, participatory diagramming and focus group discussions. A significant volume of secondary data was also collected from facilitating NGOs, communities and local forestry and wildlife posts. At the post field level, the principles of actor- oriented methodology were used at different points in the analysis to allow for some kind of analytic generalisation.

3.1. Research Approach

This study uses a case study approach. Two mapping processes in community forestry management projects are studied as examples of PGIS. The choice of the communities was based on four factors, the willingness to provide data, relative accessibility of communities, the depth and breadth of community forestry development, and relative homogeneity/heterogeneity of the communities. Forest communities in Cameroon can be heterogeneous (Biesbrouck, 2001; Brown and Schreckenberg, 2001) and it was reasoned that a choice of two cases, one mainly homogenous and another heterogeneous will be helpful in looking at variability. However the time available for this study only allowed for in-depth analysis of two cases.

Good governance is essentially multi-actor and polycentric in character and therefore any analysis of the subject, especially relating to participation, has to use a method that caters for varied perspectives and flexibility. Therefore the principles of Actor Oriented Methodology are used to analyse these case studies. It has been found to be useful in overcoming these kinds of complex multi-actor and polycentric analytical contexts (Douthwaite et al., 2002; Galindo, 2000; Webster, 2002). It is a sociological technique designed to facilitate understanding of different stakeholders in technological and social change processes. It is based on three main concepts namely intervention, interface and lifeworlds. Intervention describes “an attempt from outside a system to organize and control production”, interface refers to “the critical points of intersection or linkages between different social systems or levels of social order, where structural discontinuities, based upon differences of normative values and social interest are likely to be found” and lifeworlds is defined as “the realities that people adaptively construct for themselves” Long in(Douthwaite et al., 2002).

In this study, PGIS is considered the intervention primarily facilitated by NGOs following prescription by the MINEF. The interactions in the various processes are regarded as the interfaces whilst the various actors represent different lifeworlds. The indicators for both outputs and process in this study are viewed on the bases of key actors in the PGIS processes and for various activity and decision-making interfaces in the PGIS processes (see tables 3.1 and 3.2). Rather than going into independent interface and lifeworld analysis, in this study both are intertwined in the analysis.

3.2. Study Area

Cameroon is found in West Africa and located between latitudes 1^{o} 60 and 13^{o} 15 N and longitudes 8^{o} 30 and 16^{o} 15 East. It shares boundaries to the west with Nigeria, to the North with Chad, to the East and North East with the Central African Republic, to the south with Equatorial Guinea, Gabon, and the Republic of Congo to the southeast. It has a total area of 475 440 sq km and an estimated population of about 16 million. 70% of the inhabitants are involved in agriculture. Chief exports include crude oil, timber, cocoa bean, coffee, cotton and aluminium products.

The two study sites Tinto and Bimbia Bonadikombo are located in the South West Province of the country (see figure 3.2). Both communities are presented briefly in the ensuing paragraphs.

3.2.1. The Tinto Community

Location and Biophysical environment: The Tinto community is located in the north of the South West province of Cameroon at the main point of entry of tributaries of the Manyu River. The area is a well-drained area lying on average about 160 m above sea level with a high point of about 240 meters a.s.l. Average rainfall is about 2000mm/yr with a double peak. A short dry season occurs between November and March. Tinto falls within the rich evergreen forest areas of Cameroon known for their endemic species.

Socio-economic and cultural environment: The community consists of three neighbouring villages of the same clan, Tinto Bessinghe, Tinto Kerieh and Tinto Mbu, in descending order of size. The total population is estimated at between 1700 and 2000 (Local River blindness immunization Project records in (Minang, 2000).
It is a very homogenous community with few inhabitants (less than 1%) coming from other parts of the country. It is typically rural in character. However with the status of a subdivisional headquarters it has administrative functions including the local forest administration offices, a high school and a district dispensary. Most of the inhabitants are farmers of cocoa and coffee as cash crops and cassava, maize and other crops for subsistence purposes. Forest extraction activities include, hunting, NTFP collection and Timber exploitation.

History: The population of Tinto settled in the current location in about 1836 from the Noun Division area in the Western province of Cameroon. The families then split to occupy a wider area resulting in the three villages that make up the clan. The three Chiefs and councils have a federal system at the clan level represented by the clan council. Customary laws form the basis of clan council decision-making. The eldest chief on the throne presides over the clan council. This authority oversees local resource management policy as well. This constitutes farming rights given mainly as the ability to clear forest after paying some symbolic gifts to the council and administration of sacred groves. Some local rules have also been introduced and enforced to reduce fishing using poisons and explosives. In terms of forest management, part of the forest within the clan boundaries is in the Banyang Mbo sanctuary, wherein they

work with the ministry and another project to regulate forest management activities. Community forestry only came in November 1999 through Living Earth Foundation (an NGO). Taking advantage of the forestry law provisions the community accepted to begin the CF planning process. The community worked with the forest department staff and Living Earth through this planning process between December 1999 and November 2002. Full community management of a 1300 ha CF only started in December 2002.

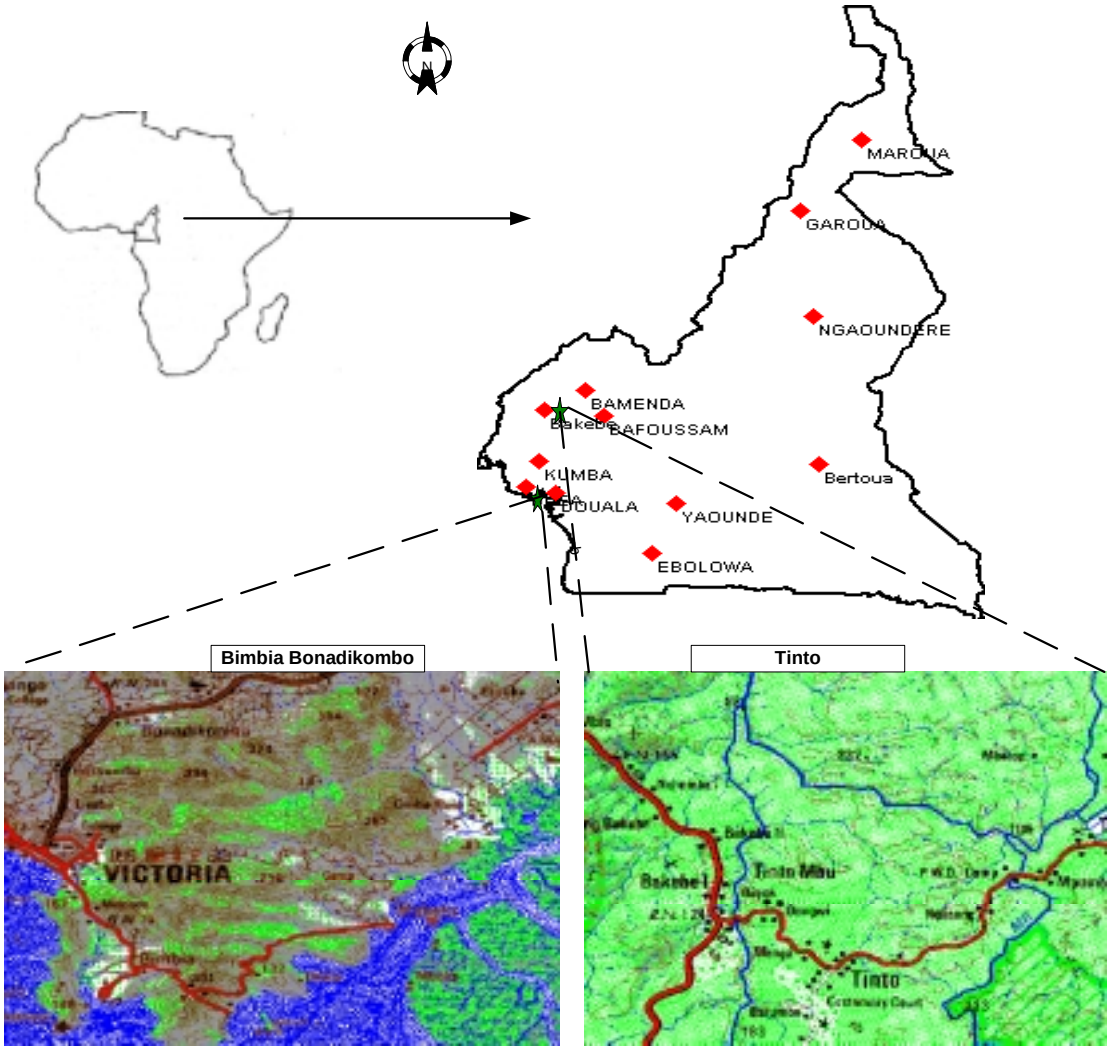

Figure 3.2: Map showing the case study sites in Cameroon

3.2.2. The Bimbia Bonadikombo community

Location and biophysical environment: The Bimbia Bonadikombo community is located on the coastline of the South West province on the fringes of the coastal zone and the slopes of Mount Cameroon with many rivers that empty into the sea. Rainfall, temperature and humidity are high. Annual rainfall is between 4000 and 5000mm per annum. A short dry season is experienced between December and February. Humidity in the area is usually between 75-80%. Vegetation is evergreen with six different types, littoral vegetation, coastal bar forest, mangrove, freshwater swamp forest, stream and riverside vegetation, and lowland rainforest

(RCDC, 2002). The forests in the area are reported to have at least 42 plant and two endemic bird species (Martin Cheek in (RCDC, 2002) including a small population of elephants.

Socio-economic and cultural environment: The community is peri-urban in character, located on the fringes of the Limbe (Victoria) urban community (see figure 3.2). Limbe and the surrounding areas has a population of about 123,900 inhabitants (RCDC, 2002). It is highly heterogeneous with few local people (of the Bakweri tribe), making the social and cultural environment complex. It is a complex of many villages namely, Mbonjo, Chopfarm, Banangombe, Bonabile, Dikolo, Mabeta, Ombe Native (Bamukong), Bonadikombo and several plantation worker camps.

There is diverse distribution of occupations for the residents of this community. A good number are plantation workers, working for the Cameroon Development Corporation (CDC) that owns huge plantations in the vicinity, some are fishermen, some farmers and some who commute to urban jobs in the heart of Limbe city. There are equally many who are involved in forest extraction activities. Forest extraction activities in order of importance include, timber exploitation, charcoal burning, and fuel wood collection for income, hunting and NTFP collection. Other activities are traditional rites and research (RCDC 2002).

History: This area is thought to have been settled by the predominant Bakweri tribe in the eighteenth century (Watts, 1994). Being a coastal tribe they were thus amongst the first tribes that were exposed to colonial influence. Due to the very fertile volcanic soils of the area, it became an important German station after the establishment of the Kamerun protectorate in 1884. The establishment of plantations in the area encouraged huge immigration into the area from the western parts of the country. This weakened cohesion within the native Bakweri tribe enabling a less traditional power structure. The paramount Chief, village chiefs and quarter heads constitute the hierarchy today (Fawoh and Fiona, 2000). In this peri urban and heterogeneous setting control of forest management by the native authorities has been difficult. The Chiefs and natives created two institutions, the Victoria Lands and Forest Conservation Committee (VLFCC) and the Victoria Area Rainforest Common Initiative Group (VARCIG) to identify and bring to justice those that illegally occupy or use the forest. The MCP came in to help improve conservation in the area. In that process they introduced community forestry as an option. The community thus agreed to begin planning for a CF in 1995. The community then worked with the MCP and MINEF through the planning process until March 2002. Actual management of the CF started in August 2002.

3.3. The Framework for Assessing CF PGIS

In order to assess PGIS for community forestry planning, a framework is developed. Two basic dimensions are in the evaluation: the outputs and the process. The two dimensions are selected through literature review (sections 2.3.6, 2.4 and 2.5), then were modified slightly in the early stages of the fieldwork following discussions with key persons in the field.

It was necessary to develop criteria and indicators for the assessment of CF PGIS for two reasons. There was need to structure the assessment process and to identify common pointers to whether or not CF PGIS promotes good governance and in what ways? Indicators were required to help simplify the complex CF PGIS experiences to be assessed. In the process of defining the indicators for assessing good governance issues in CF PGIS effort was made to consider criteria for indicator selection including relevance, validity, measurability and ease of interpretation (Dopheide et al., 2002; McCall, 2002d).

One problem with the definition of indicators encountered in this research was that of a standard against which indicators should measure in terms of "Good PGIS for good governance" and less still "Good GIS for good governance in CF". For example income as a World Bank indicator for development would have a threshold value above or below which a country can be referred to as poor or middle income. In this study no such standard was found. Developing such a reference point was also beyond the scope of this study. In this case, indications of such a "standard" is given by the good governance and PGIS experiences in sections 2.2 to 2.4. They reveal what has been seen to be "good PGIS practice for good governance" in relation to dimensions such as representativeness of outputs, legitimacy, respect for rights, equity, accountability and competence. Therefore, the analysis of the CF PGIS experiences using indicators is done in absolute terms. That is, in terms of the improvements in governance dimensions through the CF PGIS process in the Tinto and Bimbia Bonadikombo communities.

A second problem with the definition of indicators relates to the qualification of governance dimensions as "good" or "bad". This will depend on the local realities and the model that is adopted. Assessment will depend on what is locally accepted as good governance in each of these conditions. An instance of this, might be judging the legitimacy of decision-makers in a community where constituted authority on land allocation is hereditary chieftaincy. If this were accepted, then that would be a local definition of what is legitimate for a particular decision.

A third difficulty encountered in the indicator definition is the fact that this study focuses on process indicators. Indicators have been found to be more exact in describing 'state' and less exact (fuzzy) in the description of 'process' (Foneska, 2000). The multi-actor, polycentric, and iterative character of participatory processes in PGIS made it even more difficult for the definition of indicators in this study. As a result, some of the indicators apply to specific activities and / or are seen from various actor perspectives. A few also apply to the whole process (see table 3.2)

In the ensuing paragraphs, indicators of outputs are developed, then, the indicators to assess good governance in the PGIS process is also elaborated. Tables 3.1 and 3.2 show the output and process evaluation criteria and indicators.

3.3.1. Development and selection of output indicators

To develop indicators for the assessment of the PGIS outputs, a literature study was done. Three main PGIS output indicators were defined viz the satisfaction of the GI needs of main actors, output representation of ISK and the actor perception of the outputs.

3.3.1.1. Satisfaction of the GI needs of three main actors

This indicator finds out whether or not the outputs meet the purposes for which they were being made and in appropriate detail to suit their needs. It was defined based on a review of CF policy, secondary data review and interviews with actors in the field. Three main actors were considered the MINEF, the community and the NGOs or projects that ere facilitating PGIS.

The Policy provisions in the 1994 forestry law, the MoP and various articles on CF in Cameroon were reviewed to establish the GI needs of MINEF. MINEF needs maps, GPS data and tabular information on the resources found in the various forests to ensure that the plans meet specifications in the CF legislation and for collaborative monitoring and evaluation.

The GI needs for the Communities and the NGOs or projects were gotten initially from project reports and refined and confirmed through field interviews. They were found to need maps, plans with GI information in order to meet the obligations of the CF legislation, for potential development activities, M&E, meeting the conservation objectives of the facilitating agencies and to ensure greater local control of forests or secure land for future farm expansion. These GI objectives for the three main stakeholders are summarised in table 3.1.

Table 3.1: Actor Geo-Information Objectives or Needs

Stakeholder	Geo-Information Needs
MINEF	
MINEF (MINEF, 1998)	External and Internal Boundaries of CF
	Scale 1:50000 or 1: 200000
	Major natural/topographical features
	Major man-made features (e.g. Permanent forests, settlements etc)
	Compartment description for each unit
	Identification and location of plant/animal species in the area (optional)
COMMUNITY	
Community	CF and farm zone boundaries
	Inclusion of potential landmark areas (tourist sites and forest trials for tourists etc)
	Area reservation for Farm extensions
	Foot-paths
	Area under indigenous control
	Monitoring Information Farm expansion, quantity of exploited areas, etc
NGO / PROJECT	
NGO or Project	Conservation area

3.3.1.2. Representation of ISK

The representation of ISK is important in CBM because it is a means of recognition and adding value to local knowledge and the output (McCall, 2002c). Representing traditionally held lands, special traditional sites, specific local information such as names, streams, land resource systems, conflicts have been found to make maps more valuable for local PSP (Alcorn, 2000; Gonzalez, 2000; Kwaku-Kyem, 2002; Rambaldi et al., 2002; Sirait et al., 1994). In this criterion the thrust is to see whether or not ISK or local knowledge is represented on the outputs assessed.

3.3.1.3. Stakeholder perception of the outputs

The legitimacy of the outputs, especially GIT produced outputs will depend on how actors perceive them. Through the interviews, actors are asked how they feel about the outputs and why. Examples of questions discussed included, do the outputs meet the GI needs and to what extent, do the actors feel like owners of the outputs and why or why not, where the actors able to use the outputs and in what ways? The explanations of the negative and positive feelings will be helpful in concluding what aspects of PGIS promoted governance, and vice versa.

The three output indicators mentioned could fit very well in the competence dimension of governance, in terms of effectiveness in the case of meeting actor GI needs, and the ISK representation and efficiency in the case of stakeholder perception of GIT. However, due to the specific importance of outputs in the PGIS process as tools for facilitation, mediation and empowerment it was reasoned that separate attention is paid to them.

Selecting GI outputs for assessment:
The indicators mentioned above are applied to only three main PGIS outputs in each of the PGIS case studies, including the main sketch maps that emerge from the community analysis for CF area allocation, the CF boundary map, and the management plan map. The choice of only three outputs for assessment is due to the fact that time was limited and it was logical to assess the three most important outputs for all three main actors. It was also found that these three outputs were present in both PGIS processes.
The sketch maps used in community analysis and allocation decision-making are important to the communities because they look at the community resources as a whole. On the other hand the CF boundary map and the CF management plan map are important because they are required by government to grant a community forest. These reasons form the basis for which these outputs were selected for the assessment.

3.3.2. Development and selection of governance indicators

These indicators were developed based on a review of good governance and PGIS literature (Alcorn, 2000; Catley, 1999; Craig and Elwood, 1998; JICA, 1995; Jordan, 2002; King, 2002; Kwaku-Kyem, 2002; Lescuyer et al., 2001; McCall et al., 2003; NFSD, 2002; Sirait et al., 1994; UNDP, 1997b; UNESCAP, 2001)(section 2.2 to 2.4) and further refined based on discussions in the field.

From the literature review key good governance dimensions were identified including, accountability, legitimacy, participation, transparency, responsiveness, consensus orientation, equity, effectiveness and efficiency, accountability, strategic vision, resource prudence, ecological soundness, empowering and enabling, partnership, spatially grounded in communities, rule of law and rights and competence. However, for the purpose of this study, given the limited time, only five of these dimensions were selected for this study. The five dimensions were chosen because they represent five categories into which most of the other dimensions can fit or be accommodated. *The chosen dimensions include legitimacy, respect for rights, equity, accountability and competence (See section 2.4 for details).* On the other hand the review of PGIS experiences revealed important PGIS variables. *The PGIS variables included, participation, control and decision-making, access, ownership and control of information, the inclusion of local knowledge and traditional institutions, dialogue stimulation/enhancement and the influence of and on power relations (see section 2.3.6 for details).* A relationship was then established between the governance dimensions and the important PGIS variables mentioned (See appendix 1). The objective was to establish common ground between PGIS variables and governance dimensions and in order to derive indicators to be used for PGIS assessment. The results therefore are represented in the left column of table 3.2.

For practical reasons the indicators had to be more adapted to CF PGIS as experienced in the two case studies in Cameroon. This adaptation could only be done in the field. Field refinements included specification of process activities to be assessed by some indicators, output types and aspects that were applicable to all of the process aspects because these aspects could only be specified following a good understanding of the process (See table 3.2, right column).

It is worth to note that these breakdowns from dimensions to elements and then to indicators in practical terms are difficult to separate as can be seen in governance literature. One element could well be seen as fitting into any dimension with good reason. The attribution here is for the purposes of convenience and the logic developed in this study (preceding paragraphs and in sections 2.5) and not a universal attribution.

Table.2: Good Governance Dimensions and Indicators for CF PGIS used in this study.

Dimension	Indicators
LEGITIMACY	
LEGITIMACY Participation	
Representation and involvement	Representation of actors in mapping processes?
	a) During the sketch mapping?
	b) During the GPS /Compass data collection?
	c) During the Aerial Photo Interpretation?
	d) During GIS processing?
	e) Involvement in initial forest related discussions with new users during entire process?
Decision making	Direct involvement in land use allocation and use rights decisions?
	Direct involvement in CF boundary and compartment boundary decisions?
	Direct involvement in ISK inclusion/exclusion decisions?
	Involved in map content decisions?
	a) Sketch maps
	b) GIT maps
	Involved in map format or representation decisions during the process?
LEGITIMACY (Ownership)	
Access to Geo-information and GIS	Direct access to analogue GI during CBM?
	Direct access to digital GI during CBM?
	Direct access to GIS facility during CBM?
GI use	Hard copy / Printed GI use during CBM?
	Digital GI use during process?
RESPECT FOR ISK (as Empowerment)	
Empowerment	Evidence of actor manipulation /exploration /use of ISK during CBM?
	Actor involvement in any GI related training during CBM?
	Evidence of actor learning from CBM process?
EQUITY	
Change in power and control relations.	Actor gain in resource control power or access right as a result of CBM decisions?
	Lost resource control power or access right as a result of CBM decisions?
ACCOUNTABILITY	
	Presence of mechanisms for accountability during CBM?
COMPETENCE	
Dialogue Enhancement Communication	Uses information from participation indicators for sociogram presentations.
NB: Except for those indicators applicable only to specific activities and decisions, indicators are assessed based on the entire CBM process.	

Table 3.2 shows the dimensions of governance used in the assessment of CF PGIS and the specific indicators for each of the dimensions. The assessment for each of these is done abso-

lute terms with respect to each of the case studies. The essential question will be, what has changed in terms of these dimensions and indicators? If yes, is it good or bad for governance?

These dimensions can be divided into two levels: Process or the "how aspects" of CF PGIS and the impact aspects of CF PGIS. The process aspects include participation; ownership, accountability and the impacts aspects include empowerment, change in power and control relations and dialogue enhancement. However, causal relationships and overlaps between these groups can be found.

There is also a link between the output indicators and the process indicators because the outputs also constitute part of the process. These outputs are used in the process of decision-making and so the quality and information they represent has an impact on the effectiveness and efficiency of the process. The separation in this study is aimed at highlighting the importance of the output considerations in CF PGIS.

3.4. Data Collection

Three main primary data collection tools were used in this study. They include Semi-Structured Interviews (SSIs), Focus Group Discussions (FGDs) and Participatory Diagramming. The choice of these tools was based on the subjective nature of the data to be collected. Though the indicators of assessment are objective, their values are subjective. Therefore flexible tools such as SSIs, FGDs and diagramming had to be used in order to reduce bias that could be introduced by more pre-structured tools (Frankfort-Nachmias and Nachmias, 1996; Nyerges et al., 2002). The principal questions to be answered are substantive or explanatory, requiring more discursive data gathering approaches (Frankfort-Nachmias and Nachmias, 1996). However care had to be taken in the choice of key informants as well as interview management to reduce bias in the data. For example, effort was made to choose interviewees from a broad spectrum of stakeholders to ensure that no stakeholder viewpoint dominates. Two persons who did not participate directly in mapping but was actively involved in other CF activities were also interviewed to get an observers viewpoint as well.
Methodological and source triangulation was also considered in the data collection process in a bid to reduce subjectivity. The design was such that considerable overlap prevailed in the information sought for in project (NGO) reports, the FGDs, SSIs and diagramming. For example, whilst the SSIs collected information at the level of the individual, the diagramming also encouraged discussions on the same criteria for both the output and process evaluation. Restitution and feedback sessions were held in the communities to discuss the preliminary findings.

3.4.1. Interviews

In total 18 semi-structured interviews were done during this research, 9 per community. This was done mainly with key informants from different key stakeholder groups that participated in the PGIS process. Special effort was given to an initial literature review to make sure there was a balance in the representation of all major stakeholders that participated in the PGIS process (See appendix 2 for list of interviewees). The researcher's experience in facilitating community forestry was an advantage in this instance. 80% of the interviews were recorded with the consent of the interviewees and a transcript as close as possible to the recording was

done. In one of the cases where the interview was not recorded the interviewee listened to a reading of the transcripts 15 hours after the interview and some few embellishments were made.

The interviews were guided by a checklist of open-ended questions based on the output and governance evaluation criteria in section 3.2 (see sample checklist in appendix 3).
Semi-structured interviews have some advantages; they give opportunities to probe on interesting issues and allow interviewees to express the situation as they see it. The interviewer having closely studied the issues is more alert to inconsistencies and omissions and could specifically seek clarification (Fayos, 2002; Frankfort-Nachmias and Nachmias, 1996; Silverman, 2000; Yin, 1994). (Nyerges et al., 2002) also note that with less pre-structuring involved, SSIs and group discussions reduce researcher bias.

3.4.2. Focus Group Discussions and Diagramming

One FGD was held in each of the study sites with between four and nine persons. It was designed to delve into specific issues identified in the SSIs and to triangulate basic information form the secondary data and the interviews. The checklist for the interviews was re-used in this case but with more focus on areas of doubt. Specific issues addressed included amongst others, the community GI interests, opinion on GIT outputs, PGIS induced changes or influence of PGIS on the community.
The FGD has about the same advantages as the SSIs except that it requires specific group facilitation skills.

Though designed as different activities for the fieldwork, it was decided in the field that the FGD and the participatory diagramming go together, given the fact that the CBM process had taken such a long time (between 3 and 7 years) and recall of details was difficult and had to be aided by the various maps produced. It was then helpful to bring the diagramming immediately after the focus group discussion when discussions were most fresh by the debate in the FGD. The FGD and diagramming helped to bring out detail that did not feature in the SSIs during the fieldwork.

3.4.3. Secondary Data

Secondary data in digital and hard copy formats including maps; reports, official policy documents and articles were collected and screened parallel to the field primary data collection process. Examples of secondary information collected include the BB land use planning process report, Management plan for community forest case studies, stakeholder analysis and institutional development report for BB, the BB Natural resource management model, the Baseline survey report for the Tinto CF development project and progress reports for the Tinto CF project. Important parts of some reports/maps/documents were copied and important policy documents sourced. A number of participant or attendance lists for various sessions during the PGIS process were also copied. These included the main decision point meetings and workshop lists.

3.5. Data Analysis

The analysis of data collected in the field followed an actor-oriented approach. Figure 3.3 summarises the data analysis process.

Given that the data collected in this study was mainly qualitative and existed in the form of transcripts and field notes texts it was necessary to go through an orderly process of extracting relevant information relating to the various dimensions and indicators in the evaluation framework. Thereafter there was need to assess both PGIS experiences based on this information. Coding and actor oriented approach; matrices and diagramming were used in the process.

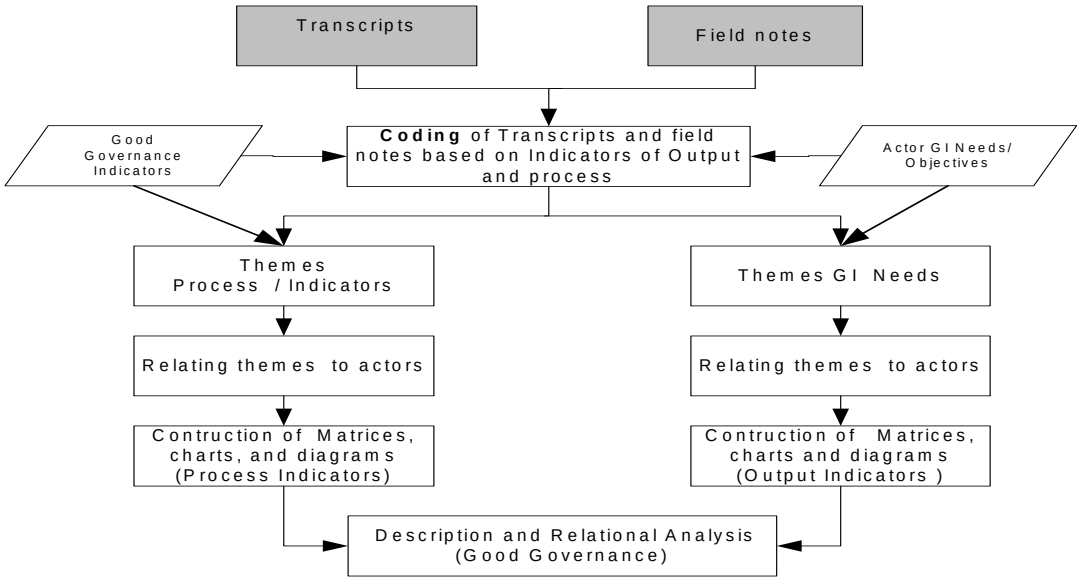

Figure 3.3: Summary of data analysis procedure

The analysis started with coding of the transcripts and field notes based on the review framework including good governance process indicators and the output indicators. Themes were developed for each of these indicators and a code attributed to each of them. A second level of coding was also done for each of the indicators of governance or output as required (see appendix 4 for summary of coding system). For example, one main theme was GI use and the sub-themes were the various categories of use. Change was another main theme and sub-themes were power relations, communication and dialogue and institutions. The codes also included actor identification to enable the establishment of relationships between actors and thematic information because the analysis also adopted and actor-oriented approach. This information was then translated into matrices or diagrams for each dimension or indicator (see examples in tables 4.9, 4.10) for both process and outputs. The matrix and explanatory information is then used in the description of performance and in more detailed relational analysis.

To discuss these findings and highlight emerging issues, a four-phase framework was designed as a model of the CF PGIS planning process. It is comprised of a preparation phase, a land use-planning phase, a CF demarcation and mapping phase, and a management plan de-

velopment phase (Tables 4.2, 4.4 and 5.1). The model was developed to enable better structuring of the CF PGIS planning process. Given that the process as developed by communities was iterative and erratic in some cases, it was necessary to develop a model from which to analyse the two systems on almost the same basis. It also answers research question number 2 (Table 1.1). The four phases in the model come partly from literature (Alcorn, 2000; Kwaku-Kyem, 2002; Lescuyer et al., 2001; Mbile et al., 2003; Sedogo, 2002; van den Hoek, 1988) and the researcher's experience in CF planning. The four phases of the model can be explained or justified by participatory spatial planning theory and also the CF planning legislation obligations in Cameroon. This model was used to do analysis and draw lessons from both experiences. Further analysis was done on the interface between local PGIS and MINEF to draw some more lessons useful for policy making and higher-level GIS.

3.6. Limitations of the Research / Data Collection

The intention of this study was to examine the extent to which the PGIS process promotes good governance. As part of the review process, outputs are assessed. Output reliability or accuracy (geographic correctness of GIT outputs) is important (Barndt, 2002) in such an assessment but was not looked into in this study. Given the time available and the focus on good governance in the PGIS process, accuracy was not considered a priority because its influence on participation and GI use is relatively small from an actor point of view. Secondly, digital data collected from the two study areas did not allow for an assessment beyond map representation. No digital data was available in the case of Tinto. In the case of BB, the available digital data for BB lacked some key data layers. With all the data available being in point and polygon format, accuracy assessment can only be limited to georefrencing checks on the current PGIS outputs and the base maps (topographic sheets) on which they were developed. It was reasoned that this will have little impact on the participation and other governance related issues that this study covers.

4. Results: The PGIS case studies

This chapter presents the research findings of this study for the Tinto and Bimbia Bonadikombo cases. First a description of the CF PGIS as experienced by both communities is made. This is followed by an assessment of the PGIS process outputs (maps) based on the criteria set in the assessment framework. The third step consists of examining the processes in terms of good governance dimensions. Lastly, the explanatory factors influencing CBM are described.

4.1. Describing the Community Forestry PGIS Process. (Objective 1)

This section begins with a brief description of the actors in both cases to facilitate better understanding of the analysis that follows.

4.1.1. Tinto

4.1.1.1. A brief introduction to the actors

The CF actors in the Tinto community are rural. Farmers in most cases are also hunters and NTFP collectors at the same time, thus making distinctions difficult. However, table 4.1 provides a summary of the main actors in the Tinto CF development process. The role, interests and available resources of actors are listed.

Table 4.1: Summary description of Tinto CF actors (roles, interests / goals and resources)

Actor	Role/Function	Interests	Resources	Comments
TCCFMC	Represents and organises the community in CF related activities	Development of CF; implementation and monitoring	Office space; Training;	Little resources available during the planning
Chiefs	Custodians of forest; authorise access to all resources; monitors	Maintain traditional control over forests; SFM	Gifts and Limited political power; Customary powers / respect	
MINEF	Oversees forest management and assists communities technically (in Principle)	SFM and forest revenue generation	Technical forestry knowledge; political power; auction sales revenue;	Faces staff and material shortages
Hunters	Participates in CF activities, key in forest demarcation, inventories	Access rights/ operations committee of CIG	Small Income from sales; Indigenous technical knowledge	
Farmers	Participate in CF development activities	Access to land for increase production	Indigenous Technical Knowledge	
Tinto Clan Council	Replicates the functions of Chiefs at Clan level; conflict resolution	SFM; maintaining traditional control over forest	Traditional authority; political influence and respect	Not an operational body
Living Earth Cameroon	Facilitate the development of sustainable CF management practices	SFM and development	Finances; access to technical knowledge forestry and GIT; lobby and facilitating skills; Link with other external agents	
Local Administration	Ensures peaceful resolution of conflicts in resource management	Peace	Political power	
Women	Participate in CF development activities	Access to NTFPs to supplement incomes	A little Income from sales of NTFPs	Often very busy
Tinto Rural Council	View and support CF as a long term development project in the area		Workshop/meeting facilities; Political power and influence	

(Partly c.f. Minang, 2000)

4.1.1.2. PGIS Process Description

Participatory GIS as experienced in Tinto can be presented in three broad phases corresponding to groups of activities or processes that produce the three principal PGIS outputs viz a sketch map, a CF boundary map, and a management plan map. Phase one involved mainly stakeholder analysis and PRA applications ending up with a sketch map, phase 2 involved mainly the community forest external boundary demarcation and mapping wherein a GIS boundary map was produced, and phase 3 involved the development of the management plan in which a map showing the management zones is produced. Figure 4.1 is a summary of the Tinto CBM process.

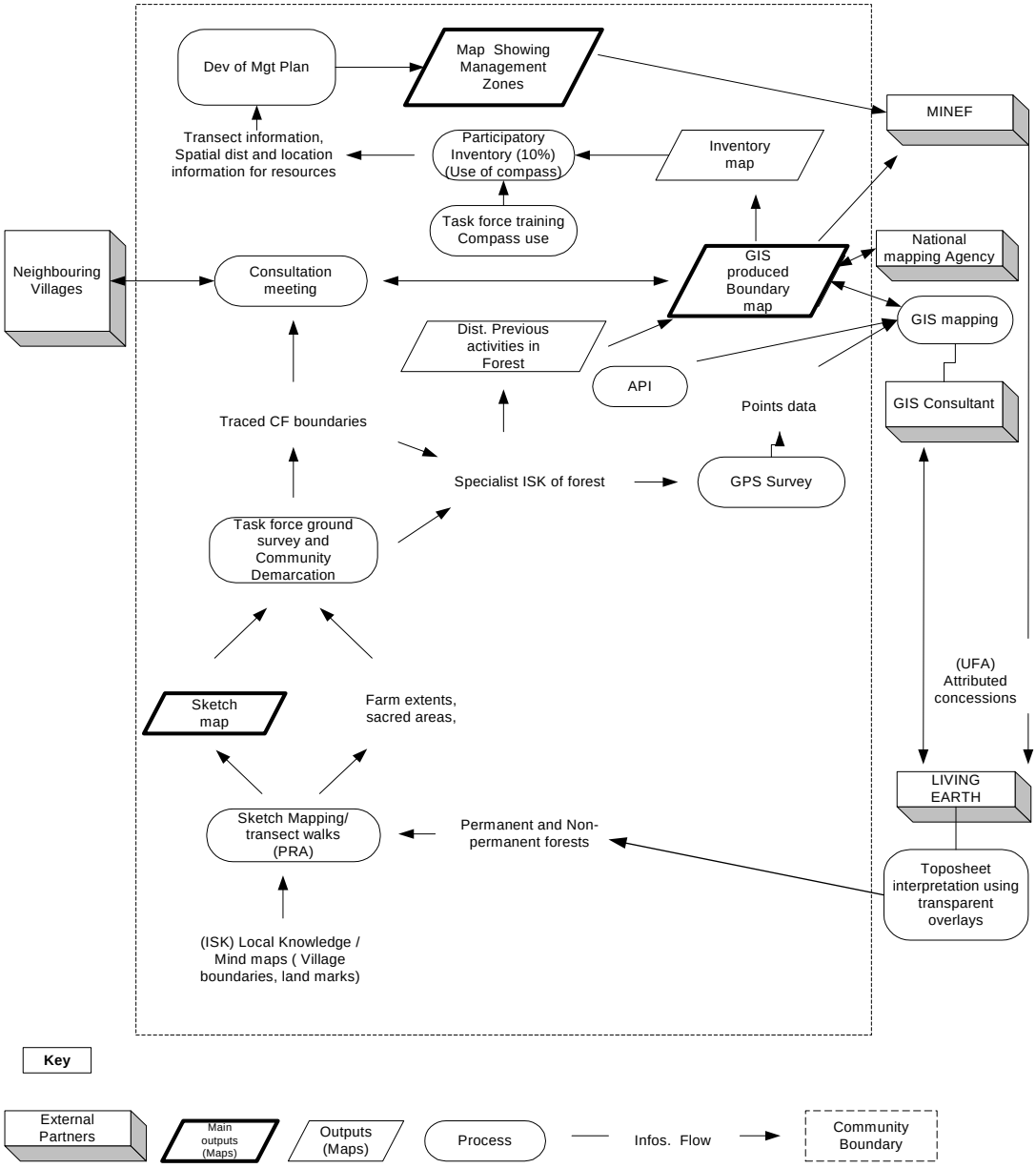

Figure 4.1: Tinto PGIS diagram

Phase one had as general objective to enable a general understanding of the stakeholders, the socio-economic and cultural context and the resource situation in the Tinto community. To this end a number of activities were carried out. The facilitating NGO Living Earth sourced information from local and regional MINEF offices regarding conservation areas and all sorts of permits that had been authorised for the Tinto area, and manually overlaid that information (using transparencies) on topographic maps of the area. This enabled the community and facilitating organization to find out if there was forest area available within the Tinto community for a community forest. Upon finding out that there was some forest area not under the protected forests (community can only be attributed for non-protected forest areas) they then proceeded with PRA applications. Venn Diagrams, interviews and focus group discussions were used in the stakeholder analysis, participatory sketch mapping, and historical timelines and transect walks were used in the community resource analysis. Other tools such as sea-

sonal calendars, farm sketches and farm interviews were also used to support the aforementioned analysis. See figure 4.2 for the Sketch map.

Once common understanding was established, then in phase two the objective was to designate, demarcate and map the community forest. Two main activities were carried out in order to meet these objectives. To start with, the community discussed in meetings and appointed fifteen community ("surveyors"), mainly experienced male hunters- five from each of the three villages, to consult elders versed in the forest around the communities and suggest reasonable landmark boundaries for the CF. They were also asked to consider current farm extents and allow ample forest to accommodate farm expansion in the years to come. These surveyors moved around farm extents in the intended area and identified landmarks. These were suggested, debated upon and agreed upon at two levels, first at the clan council meeting and at a general meeting. Through community labour all male adults went out and traced (on the ground) the agreed boundary with the exception of boundary lines defined by streams and rivers. Thereafter Living Earth brought in a consultant who did a GPS survey along the traced boundaries and along transects through main features in the forest with some of the surveyors. During the GPS survey, the consultant and surveyors then did some interpretation of 1:20000 aerial photographs (acquired by the NGO upon the consultants request) to confirm certain features. The point data, sketch map and aerial photos were taken away and processed into a map by the consultant using Arc view. The GIS produced map was brought back to the community about a month later. See map in figure 4.3. This CF boundary map was presented at a consultation meeting of all the stakeholders including neighbouring villages for confirmation of boundaries. As soon as it was confirmed this map was taken to the NIC for an attestation of surface area. The last stage here was to send the certified map to MINEF alongside the CF application.

Once MINEF gave an initial approval based on the dossier filled in by the community, including the external boundary map, the community set out on phase three. The objective at this level was to develop a management plan in which the forest was divided into compartments or zones. The main activities that contributed to achieving this objective included an 8% participatory multi-resource inventory and mapping to show the internal boundaries of the community forest. About 23 community members including 3 women received training in standard inventory techniques. Three of them were trained in the use of compasses that were bought by LEF for the community. The GIS produced boundary map done during phase two was used as the base map for the inventory. Then the compartment boundaries were drawn by hand on a copy of the NIC-certified topographic map portion of the area. See figure 4.4 for the compartment map. This map was also sent to MINEF alongside the management plan including a description in table form of the participatory inventory findings for final approval.

Summary

Table 4.2 presents a summary of the narration above for every phase. The table provides a breakdown for each phase into; the participatory tools used, the GIT tools used, actors involved, the steps involved, outputs and some relevant observations relating to decision-making.

Table 4.2: Tabular summary of the PGIS process in Tinto

Nov. 1999	**Preparatory Phase** I	**Land Use mapping and Planning** II	**Community Forest Boundary Mapping** III	**Community Forest Management Plan Mapping** IV Sept 2002
Steps Involved	-Stakeholder analysis; -- -Preparatory meetings; -Manual Overlay of tranparencies by Living Earth -PRAs -Baseline study	-Sketch mapping, -Transects, -Reproduction of map introducing CF specifications by six MC Persons	-CF Boundary discussion and agreement in meeting -Ground demarcation by all men in villages -GPS Survey (14 "surveyors") -GIS mapping by consultant	-Participatory Inventory planning meetings -Inventory training -Carrying out inventory -Desk acrtography by six persons (forestry consultant and MC members - Meeting to agree on zones
GIT Tools	Topgraphic sheets, manual transparency overlay.	Topographic sheets	GPS, Aerial Photo Interpretaation, GIS mapping using Arcview	Compass training and use in Inventory, Toposheest and desk cartography
PRA Tools	Meetings, venn diagrams, seasonal calendar, village timelines	Participatory sketch mapping,transect walks, forest use matrix, CF area use map,	,Meetings, Participatory Sketch mapping for forest decsription	Participatory inventory, workshops and meetings
Actors	LE, Chiefs, MINEF	LE,MINEF,Chiefs,Hunters,TRC,Community Quarter / village representatives, women, MC	14 hunters -five nominated by each village, GIS consultants,LE,MINEF	23 inventory team volunteers from three villages, LE, MINEF, Forestry consultants
Outputs	Village study report, Seasonal Calendar	Village sketch map, social map of the village	GIS produced CF Boundary map including other land use zones, transect or cross section, sketch map describing current forest use	Map showing compartments / management zones / Desk cartography
Participation Intensity / Purposes	Consultation	Decision making / Empowerment	Interactive / Empowerment	Decision-making for zoning / Empowerment
GI Use	Strategic	Strategic, Tactical, Organizing	Tactical and adminitrative	Strategic, Administrative, Tactical

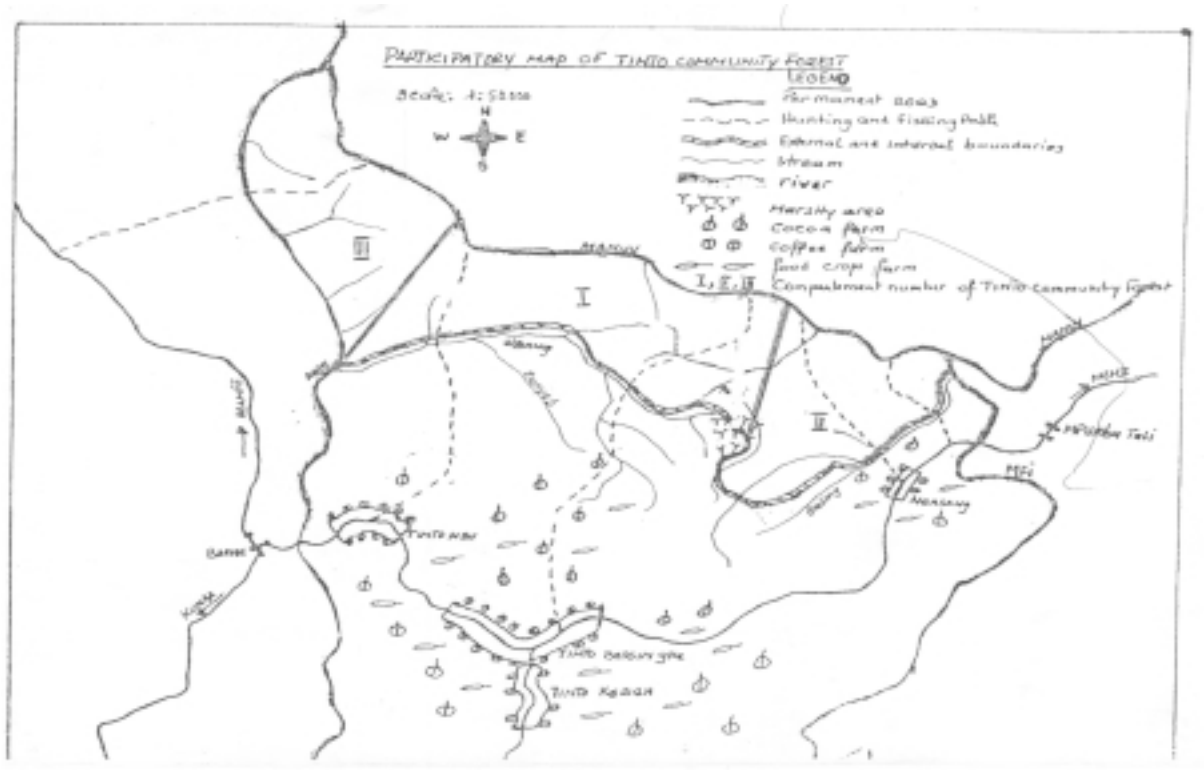

Figure 4.2 Sketch map produced during Phase 1 of the Tinto PGIS (Source

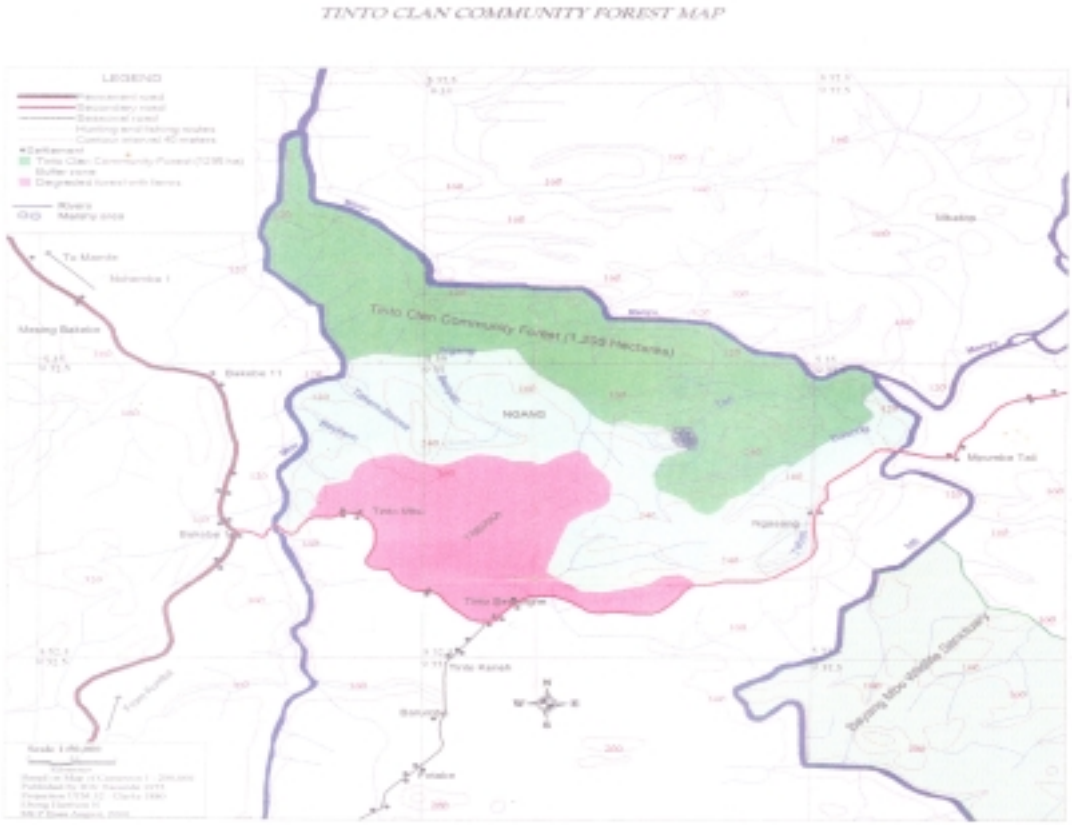

Figure 4.3: Map produced (Scale 1: 50000) during Phase II-Tinto PGIS (Source-TCCF CIG)

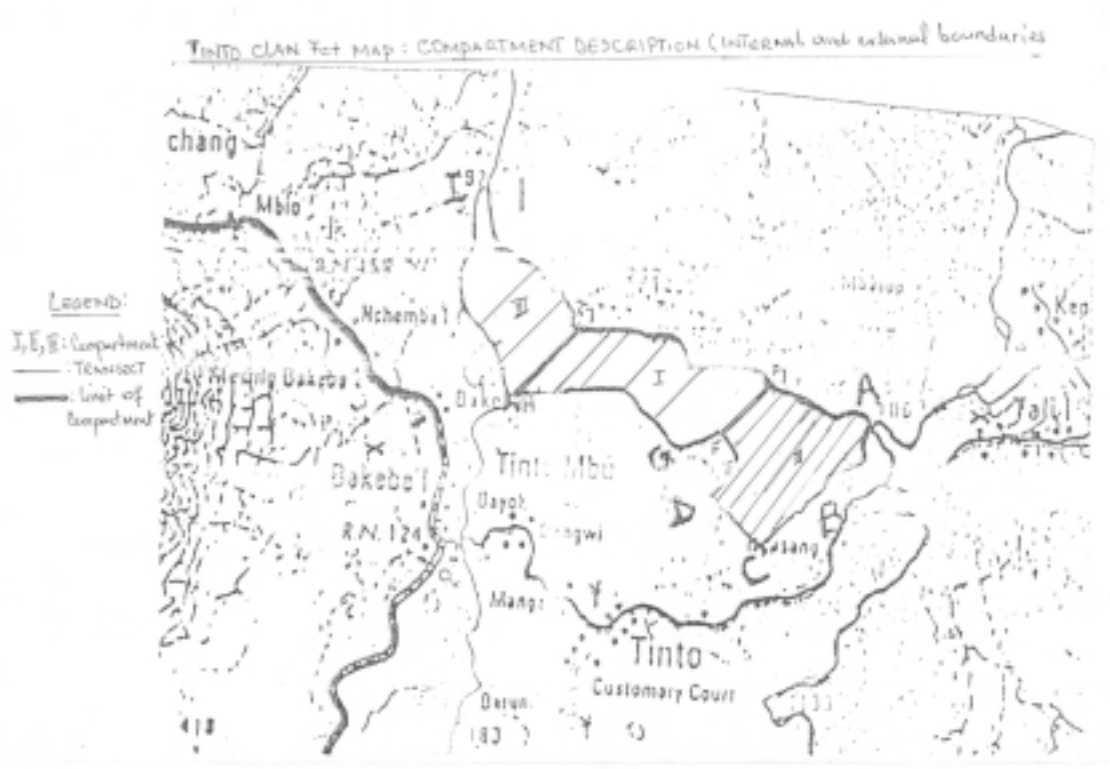

Figure 4.4: Map produced during Phase III; Tinto PGIS (Source: Living Earth)

4.1.2. Bimbia Bonadikombo

4.1.2.1. A brief introduction to the actors

Being a peri urban community, the CF actors in the BB case are pretty diverse. Some forest users come from about an 80 km diameter. A brief summary of the main stakeholders is presented in the table 4.3. The role, interests and resources of the actors are mentioned.

Table 4.3: Summary description of the Bimbia Bonadikombo CF Actors

Actor	Role / Functions	Interests	Resources	Comments
BBNRMC	Represent the community and coordinate CF related activities	Implement land use plan; develop and monitor CF development	Office, Allowances, Training, revenue from permits, fees etc	
Chiefs	Custodians; authorise access to all resources; monitor	Establishing and reinforcing claims to traditional lands	Fees, gifts and limited political power	
CDC	Rightful leasehold owners of most parts of forest; expansion of farms	Increased production and profits	Finances; limited GIT facilities; political power	Purely business perspective
Timber Exploiters	Participation in CF through exploitation	Unperturbed access to tree resources	Direct income from activity	Difficult to identify because they come from a wide radius
Farmers (Including women farmers)	Registration with BBNRMC and land use plan implementation (reforestation)	Access to land for increased food production	Income from crop sales	
Charcoal Burners	Participation in CF activities	Access to tree resources	Direct income from activity	
Firewood Collectors	Participation in CF development activities	Access to tree resources	Direct income form activity	
MINEF	Oversees forest management and supposed to help communities technically in CF planning	SFM and forest revenue collection	Technical forestry knowledge; political power; auction sales revenue;	Faces staff and material shortages
Traditional Doctors	Participation in CF development activities	Use rights	Income from herb sales etc.	Not easily identifiable
MCP	Facilitate forest planning and management activities	Development of a viable resource management model for participatory biodiversity conservation	Finances; technical knowledge forestry and GIT; Lobby strength; facilitating skills	
Limbe Urban Council	Support for CF development to reduce forest resource degradation	Urban and peri urban development land use planning	Financial and workshop/meeting facilities	
Elite	Promote CF development in terms of lobbying and mobilization	Establishing and reinforcing claims to traditional lands	Political power; financial resources to a limited extent.	
Hunters	Participate in CF development activities	Use rights	None	Not easily identifiable
Local Administration	Ensures peaceful resolution of conflicts in resource management	Peace	Political power	

(Partly c.f. Tekwe et al, 2001; RCDC, 2002)

4.1.2.2. PGIS Process Description

Participatory GIS as experienced in Bimbia Bonadikombo can be presented in three broad phases corresponding to groups of activities or processes that came up with the three principal PGIS outputs viz, a land use plan map, a CF boundary map and a management plan map respectively. Phase one involved mainly stakeholder analysis, PRA applications and GPS survey ending up with GIS produced boundary map, phase 2 involved mainly of convening a stakeholder forum and through sketch mapping producing a land use map. Phase 3 involved the development of the management plan in which a GIS map showing the management compartments was produced. Figure 4.5 below shows a summary of the Bimbia Bonadikombo PGIS process.

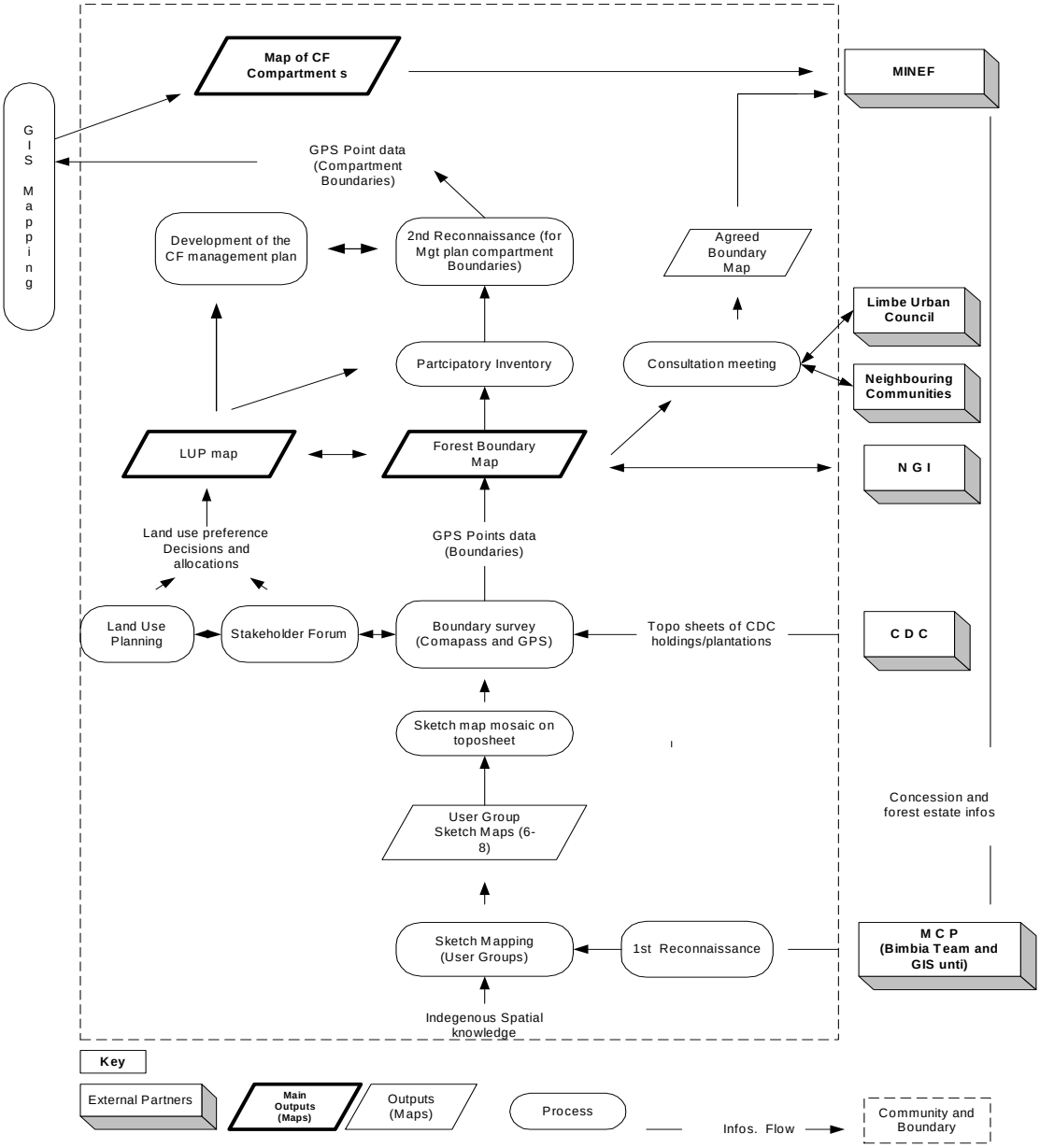

Figure 4.5: Bimbia Bonadikombo PGIS diagram

Phase one in the Bimbia Bonadikombo experience was mainly involved with mapping out the boundary of an intended conservation area of a project and trying to develop a good knowledge database of the area. Two activities were involved at this stage. Firstly the Mount Cameroon Project sourced information from local and provincial offices of MINEF on the status of forests in the area. A reconnaissance survey was done based on this information to identify sensitive biodiversity areas requiring protection. Village user groups were then asked to sketch their areas of the forest. Both present and intended use maps were made from this process. Based on the reconnaissance and the sketch maps, the project carried out a GPS survey and produced a GIS map of the area they intended to protect (see figure 4.7). The 4 Rs, interviews and focus group discussions were also used in stakeholder analysis at this stage.

With a given area identified and the stakeholders known, phase two of the CBM process aimed at bringing the stakeholders together to compare their different spatial use claims and try to bring them into line; and also to agree on the best uses for various sections of the forest. During this stakeholder forum, perception mapping was done on perceived pressure on resources. A 3-D impression of the area made of foam and paint by an artist with a brief from project staff; maps from the state plantation company in the area (CDC), and the NIC topographic sheets were used to support the discussions. A land use plan was agreed to and a sketch map produced. Figure 4.6 shows the BB forest sketch land use plan produced during the stakeholders' conference. The plan adopted community forestry as the main status of their forest. The forest was then divided into an agroforestry zone, a farm area and a core area that is exclusively for conservation. These decisions then allowed the GIS produced map to be taken to the NIC for certification and thereafter an application file was submitted for a CF. However, it is worth noting that as a side benefit, through the sketch mapping and the discussions with the maps from the CDC, participants at the forum realised that a good proportion of the forest in question was under CDC leasehold. As a result, they decided to write to the CDC and government authorities in the area for these portions to be returned to the community.

Once initial approval (reservation) came through from MINEF, the community set out on phase three. The aim of this phase was to develop a management plan that included dividing the forest into management compartments. A limited participatory inventory was done given that quite some geo-referenced information had been collected by the MCP project activities. A GPS survey was done by a group of designated community persons and MCP staff using the LUP sketch map to propose compartment boundaries. The GPS point data like in phase one were taken to the MCP GIS lab where a GIS compartments map was produced using Arc view. This map was presented, discussed and approved at a second stakeholder/ management plan meeting. Figure 4.8 shows the compartments of the BB forest. This map later accompanied the management plan document to MINEF for scrutiny and approval.

Summary

A structured summary of participation in the different phases is presented in table 4.4 The table shows for every phase, the participatory tools used, the GIT tools used, actors involved, the steps involved, outputs (intermediary as well as final) and some relevant observations relating to decision-making.

Table 4.4: Tabular summary of PGIS process in BB

1995	**Preparatory Phase**	**Land Use mapping and Planning**	**Community Forest Boundary Mapping**	**Community Forest Management Plan Mapping** March 2002
	I	II	III	IV
Steps Involved	-Stakeholder analysis -Socio-Economic studies -Conflict analysis -PRA s -	-Sketch mapping in small user groups -Reconnaissance visits in small teams -Preparation of sketch map mosaic to identify areas of conflict -Negotiations and discussions to arrive at land use plan	-Ground Boundary survey and confrimation by farmers and the CDC -GPS Survey -GIS mapping by MCP	-Participatory inventory planning meetings -Study of aviaible plant and animal information available from MCP research -Carryout participatory inventory -GPS and compass survey -GIS mapping
GIT Tools	Standard Tographic sheets from MINEF, CDC.	3-Dimension impression of area, toposheets, MINEF and CDC	GPS, Compass, GIS mapping using Arcview	GPS, Compass in inventory, GIS Mapping Using Arcview
PRA Tools	Meetings, conflict mapping, Socio-economic surveys, venn diagrams	User group sketch mapping , participatory land use plan sketch mapping, meetings, transect wlalks, forest reconnaissance	Meetings, Participatorysketch mapping for description	Participatory Inventory, Workshops, meetings
Actors	MCP, MINEF, Chiefs, LUC	Farmers, Hunters, Timber Exploiters, charcoal burners, Fuelwood collectors, VLFCC, VACIG, Women, LUC,MCP,MINEF, MINAGRI,Chiefs,CDC and Elite	Village User group representatives, MINEF,MCP	Village user group representatives, MCP, MINEF
Outputs	Socio-economic study report,	User group sketch maps, perception map for pressure, current use, soils, farm extents, land use plan sketch map, transects/cross sections	GIS produced CF Boundary Map	GIS produced compartment / management zones map
Participation Intensity	Consultation	Initiating Action / Empowerment	Interactive / Empowerment	Decision making for zoning / Empowerment
GI Uses	Tactical	Strategic, organizing, administrative.	Tactical, Administrative	Strategic, Tactical and Administrative

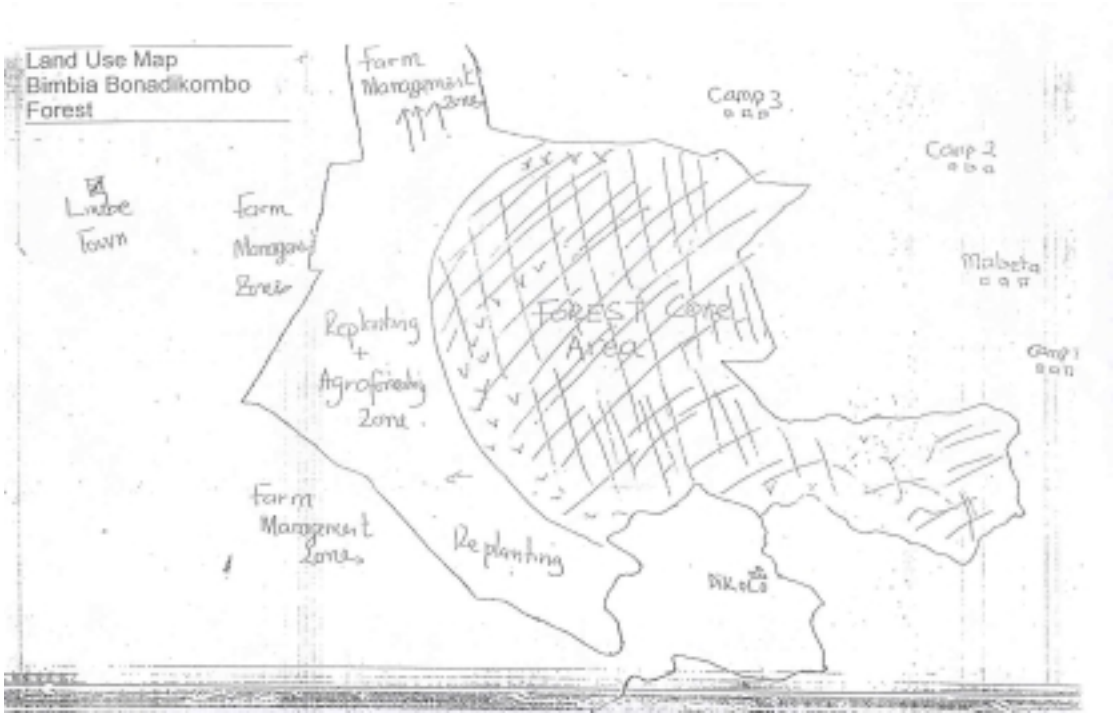

Figure 4.6: Sketch land Use plan map produced during Phase II of BB PGIS (Source: BBNRMC)

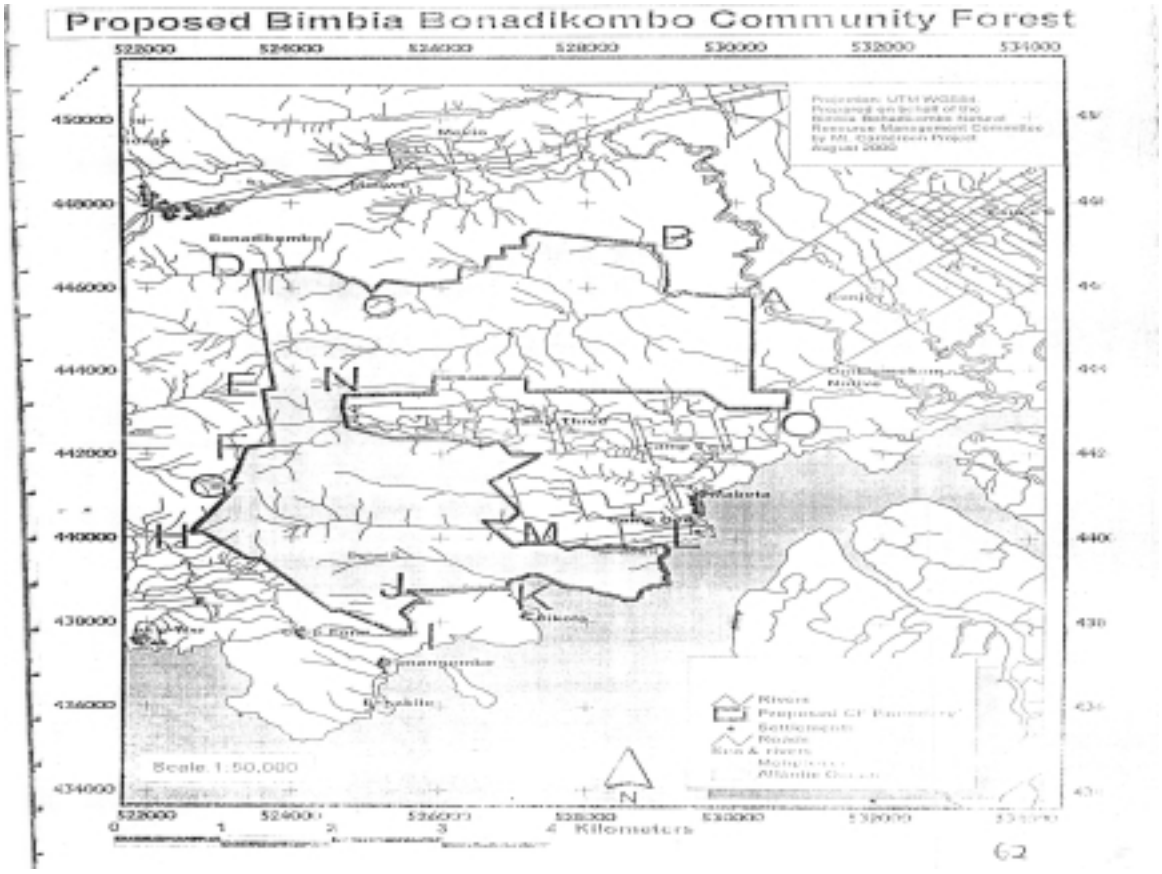

Figure 4.7: Map produced during Phase I of BB PGIS (Source: BBNRMC)

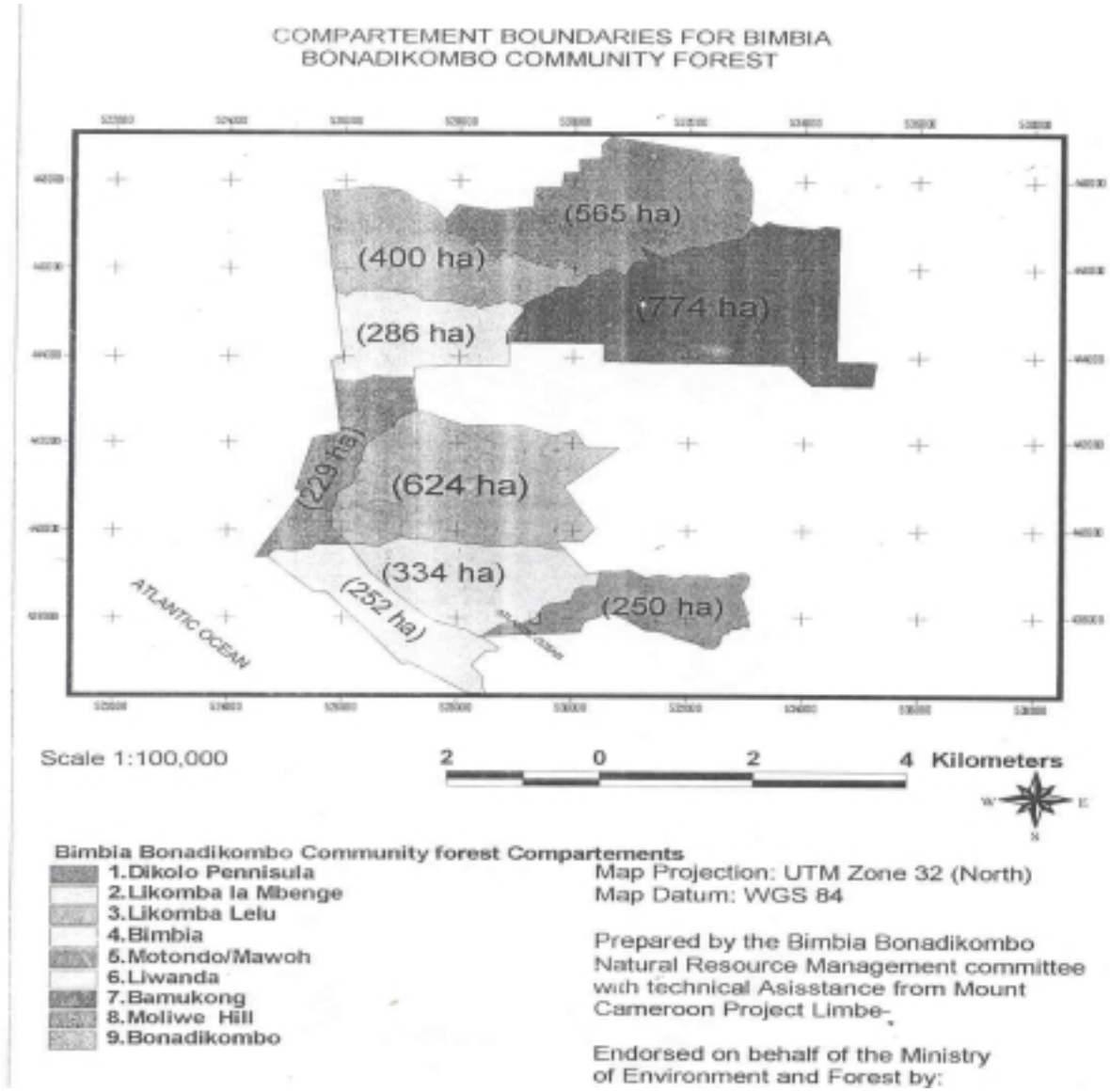

Figure 4.8: Map Produced during Phase III of BB PGIS (Source: BBNRMC)

4.2. Assessment of GeoInformation outputs (Objective 2)

Three main outputs from the CBM processes are evaluated in this section in terms of the assessment criteria, namely, the extent to which they satisfy actor geo-information needs or objectives, the extent to which they represent ISK, and in terms of actor perception as a determinant of output legitimacy. The same outputs highlighted in the preceding section are assessed for both cases.

4.2.1. Output Performance

The performance of each output is rated in a table against MINEF, community and the project or facilitating NGO GI objectives.

4.2.1.1. Tinto GI Outputs

Table 4.5 presents an overview of the performance of these outputs against the actor needs.

Table 4.5: Output performance in terms of satisfying actor GI objectives

Actor	Geo-Information Need / Objective	Sketch Map (Fig 4.2)	CF Boundary map (Fig 4.3)	Compartment or Management Plan map (Fig 4.4)
MINEF (MINEF, 1998)	External and Internal Boundaries of CF	N/A	◔	●
	Scale 1:50000 or 1: 200000	N/A	●	○
	Major natural/topographical features	N/A	●	◔
	Major man-made features (e.g permanent/protected forests, settlements etc)	N/A	●	◔
	Compartment description for each unit	N/A	N/A	●
	Identification and location of plant/animal species in the area (optional)	N/A	N/A	○
Community	CF and farm zone boundaries	◔	●	N/A
	Inclusion of potential landmark areas (tourist sites and trials etc)	○	○	○
	Area reservation for farm extension	○	●	N/A
	Foot-paths	●	●	N/A
	Monitoring Information Farm expansion, quantity of exploited areas, etc	◔	◔	N/A
NGO or Project	Conservation area	●	●	●

Key

● Largely meets need ◔ Partially meets need ○ Does not meet need N/A Not Applicable

From the evidence in the table 4.5 the following observations can be made on the extent to which the outputs fulfil the respective actor geo-information needs.

The sketch map meets about half of the community and largely meets the NGO GI objectives. It however does not indicate the potential landmark sites for things like tourism. The area for possible farm expansion is also not shown. The monitoring information shown is largely due to chance as there is no evidence pointing to the fact that it was planned. This map is a purely PRA produced map by community members.

The CF boundary map meets about three quarters of the objectives of all the stakeholders. It is evaluated on all (except two MINEF objectives) actor objectives because it does serve all the actors objectives. It fails to meet the same objective as the sketch map, i.e. the inclusion of potential landmark areas (tourist sites and trails). It is thus the closest in terms of meeting

GI objectives. This map is basically produced using GIS, in which community members participated in GPS point data collection and API to support the process.
The compartment map satisfies slightly more than half of the objectives it was required to meet. It equally does not meet the same objective the outputs from phases one and two fail to meet. This map was done using desk cartography on a topographic sheet from the NIC.

Overall, the evidence in this case points to the fact that the CF Boundary map meets on average most of the objectives of all actors. The compartment map ranks second with whilst the sketch map comes third with.

4.2.1.2. Bimbia Bonakimbo GI Outputs

Table 4.6 below presents the performance of these outputs with respect to the actor objectives.

Table 4.6: Output performance in terms of satisfaction of actor GI objectives

Stakeholder	Geo-Information Objective	Sketch Map (Fig 4.6)	CF Boundary map (Fig 4.7)	Compartment or Management Plan map (Fig 4.8)
MINEF (MINEF, 1998)	External and Internal Boundaries of CF	N/A	◔	●
	Scale 1:50000 or 1: 200000	N/A	●	○
	Major natural/topographical features	N/A	◔	○
	Major man-made features (e.g Permanent forests, settlements etc)	N/A	●	○
	Compartment description for each unit	N/A	N/A	●
	Identification and location of plant/animal species in the area (optional)	N/A	N/A	○
Community (From Interviews)	CF and farm zone boundaries	●	○	N/A
	Inclusion of potential landmark areas (tourist sites and trials etc)	○	○	N/A
	Foot-paths	○	●	N/A
	Area under indigenous control	●	◔	N/A
	Monitoring Information Farm expansion, quantity of exploited areas, etc	◔	◔	N/A
NGO or Project	Conservation area	●	◔	●

Key: ● Largely meets need ◔ Partially meets need ○ Does not meet need N/A Not Applicable

From the evidence in table 4.6 above the following observations can be made on the extent to which the outputs fulfil the respective actor geo-information needs.
The sketch land use plan map was done based on comparisons of multiple PRA sketch maps of resource perception, soils, farms and others (See appendix 5 for intermediary maps).
It meets close to a third of the GI objectives of the community and the project. Two objectives were not met by this output. They include the inclusion of potential landmark areas for

tourism and the footpaths. In this case evidence shows the monitoring objective was not planned for at the beginning of the mapping.

The CF boundary map meets about half of the GI objectives of all the actors. It fails on the other hand to meet two community objectives including showing the farm zone boundaries and the potential tourism features. The map does not also show basic reference features such as roads. This was done using GIS. Field data collection for the mapping involved community members.

The compartment map on its part meets slightly less than half of the MINEF and project GI objectives on which it was assessed. The wrong or unprescribed scale was used, whilst major topographical and man made features are not represented. The main plants are not represented either. This map was done using GIS and participation by community in data collection.
In this case the land use plan sketch map came first, the CF boundary map second and the management plan map third.

4.2.2. Output representation of Indigenous Spatial Knowledge (ISK)

This criterion is assessed for all three main outputs in both cases. It looks at whether or not local knowledge is represented and what knowledge is represented. Indigenous or local spatial knowledge in practice can be understood to mean unique spatial features to a given / defined area or spatial unit; it could be natural, man-made, local land and resource use arrangements and perceptions of space. There is also growing reference to spatial knowledge in terms of economic, social, equity and livelihood issues. The following tables show the local spatial knowledge that was represented in the main PGIS outputs.

4.2.2.1. Tinto

Table 4.7: Tinto CBM outputs representation of ISK

Criterion	Sketch Map	CF Boundary Map	Management Plan map
Representation of ISK?	Yes	Yes	Yes
Description of Knowledge represented.	•Settlements •Farm and crop extents •Village boundaries •Local stream and stream names •Footpaths •Local village names	•Farm extents •Village boundaries •Local streams names •Marshy areas in forest •Local village names	•Local village names •Local stream names

Most of these features were represented on the sketch map using symbols whilst on the GIS produced map, and the management plan map conventional cartographic representation was used (see figures 4.2, 4.3, 4.4). There was no evidence of community request for some sensitive geographic data layers to be protected.

4.2.2.2. Bimbia Bonadikombo

Table 4.8: BB CBM outputs representation of ISK

Criterion	Sketch Map	CF Boundary Map	Management Plan map
Representation of ISK?	Yes	Yes	Yes
Description of Knowledge represented.	•Farm extents •Local place names •Local settlements •Local resource evaluation and perception	•Local place names •Plantation layout and extents •Local streams	•Local place names •Local features (Hills, peninsular etc)

In this case most of the map objects, including intermediary products (appendix 5) were represented using standard cartographic techniques.

4.2.3. Perception of outputs as determinants of legitimacy of PGIS.

From the transcripts the opinions of the actors were elicited. This was based on open-ended questions during the interviews and the focus group discussion asking the actors what they liked and did not like in the PGIS process. These opinions (positive and negative) are summarised for each case study in this section.

4.2.3.1. Tinto

Some positive opinion themes in this case have been related to the value of the output. Actors interviewed opined that they trusted the GIT produced maps for the following reasons,

- That the process of making them started with them and they were told that a map would be made.
- That they were amongst those who made the decisions on the boundaries and they think the map represents what they decided in terms of the boundaries of the forest and the buffer zones.
- That it showed the traditional boundaries of the clan villages, the hunting paths and seasonal streams in the area that you do not see on the government map.

On the other hand the negative opinion expressed was the fact that they thought that a cave in the forest should have been indicated on the map because of its potential for tourism revenue generation.

Regarding what to include in the map there was a traditional site (shrine) in the forest, which the "surveyors" claimed the elders told them not to visit. Though not on the map, the actors were clearly not so sure about whether it would have been appropriate put it in the map or not.

4.2.3.2. Bimbia Bonadikombo

In term of outputs a number of positive opinions were recorded. Actors acknowledged that the GIT maps had rightly captured what they had decided upon during the meetings and the LUP fora. They said they could recognise it because they know what they decided on. In response to why they believe such a product even though they did not make it themselves, they replied in most cases that they could see their decisions relating to boundaries as clearly represented on the map.

A second strong positive opinion on the output was the name or title of the map. Mr Kema Elive, Adviser to the BBNRMC put it this way "…just by the name (of the forest and map) it is recognised that we have ground control. It is so obvious (i.e. the authority of the natives over forests) to the extent that non-indigenes now accept that for once the natives are custodians of the forest." This feeling of ownership from the naming of the forest was re-echoed in some of the interviews.

The negative opinions relating to output were as follows; first during the focus group discussions it was noted that none of the PGIS outputs showed the "hills" (supposed to mean height) in the area. This meant that they could not appreciate the ease of movement or make decisions on the convenience factor in management.

MC members reported the inadequacies of the GIT products for monitoring purposes, as they do not clearly show where the farms are.

Another expression of frustration is the fact that government does not fully accept the products from this process. The fact that communities still have to go to the NIC for certification on a different map (which they consider not up to date) means that there is no complete legal recognition for the outputs.

One controversial issue of debate during the discussions in the focus group was whether roads and paths were supposed to be shown on the map. Those for its inclusion said it will facilitate planning of transportation of timber and will be helpful for planning controls. Those against argued that those enforcing the controls knew the forest very well and did not need the maps to know how to get around in the forest, they said it will only help timber exploiters escape with timber. These actors could not agree on whether it would have been better to include or exclude paths and roads from the map outputs.

4.3. Identification and description of factors influencing PGIS (Objective 3)

This section presents the forces that influence the trajectory of PGIS processes as recognised in the two case study areas. Field observations for this objective were guided by literature (Alcorn, 2000; deMan, 2000; deMan and van den Toorn, 2002; Kwaku-Kyem, 2002; MINEF, 1994 ; MINEF, 1998; Sirait et al., 1994). In order to recognise these forces in the field, the inquiry focused on examining the direct and remote causes of problems during the PGIS

process, the reasons why certain decisions were taken during the process and the roles of various actors in the SSIs, FGDs and the diagramming sessions. The author's experience was also useful. The factors are presented in order of significance in this section. This significance was determined by a qualitative appreciation of how decisions in the PGIS process were influenced by each of these factors. The relationships each factor has with other factors could also serve as an indication of its influence on these factors during the CBM process. These factors are listed and then an explanation of their influence is provided.
The factors observed in these two cases have included, CF policy, the degree of community organisational development, local land tenure provisions, history of relationships between actors, civil society (NGO) facilitation and resource availability. Figure 4.17 below helps show the relationship between these forces and PGIS. The factors that influence PGIS interfaces are not easily evident from first sight and may sometimes appear contradictory.

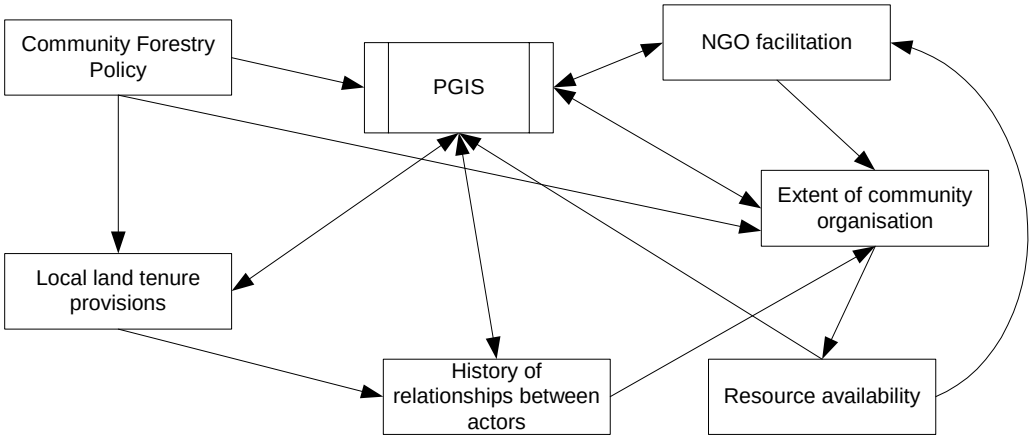

Figure 4.9: An illustration of relationships between factors influencing PGIS

Though there can be complex relationships with chains amongst these factors, we only focus on the direct relationships between PGIS and the various factors. It was observed from the evidence in the PGIS interfaces studied during this research, that all these factors could be either favourable or unfavourable to the development of good PGIS given different circumstances. In this study it was observed however, that PGIS also influenced some of these factors including, community organisational development, local land tenure provisions, the relationship between actors and civil society facilitation.

A brief description of specific details of each relationship is provided in the ensuing paragraphs. However the impact of these factors on PGIS governance indicators is discussed in the discussion of good governance in the chapter that follows.

4.3.1. CF Policy and PGIS processes:

CF policy sets conditions for CF PGIS planning with specific detail regarding the kinds of outputs, some aspects of the process and institutional conditions. These aspects could either favour or restrict PGIS dynamism, thereby influencing its potential for the promoting good governance in the CF process. Some favourable aspects include,

►Policy requiring communities to show proof of actor involvement and agreement on the boundaries and the management plan activities before CF approval.

►The required publication of the external boundary map for 45 days to ensure that any protests are recorded and duly solved by the community prior to the submission of the community application for a CF.

►The compulsory written explanation required from MINEF staff if the CF application from a community is not approved.

Other aspects that restrict the PGIS process dynamics include,

►The prescription of scales (1:200000 and 1:50000) that are suitable for generalized work at regional or ministerial scale but not convenient for work at community level.

►The fact that communities have to certify the PGIS maps at the NIC as required by MINEF. It is discouraging to them and to facilitating organizations, as they increasingly get aware of and competent with the advantages of the technology and the fact that the certification is not a verification of their CBM process but just another link on a bureaucratic red tape.

4.3.2. Community Organisational development and PGIS processes:

A very strong mutually beneficial relationship was observed between PGIS and community organisation. Strong institutions in the case of Tinto built over a thirty-year period of joint water management between the villages provided a representative model for PGIS work in the area of forestry. The TCCF followed the equal village representation the community had mastered through the water project. In the BB case, no such experience existed. User group representation was thus adopted to create the BBNRMC (The CF management body). However exceptions existed for both cases, in Tinto a group of hunters (user group) was formed in equal numbers from each village to take care of activities in the forest, such as demarcation and inventories. This was because of their specific knowledge of the forest areas. In Bimbia, the operations committee (a specific group under the BBNRMC in charge of in-forest activities) was also formed based on equal representation from the villages. In both cases, whilst PGIS tried to work within the established institutional arrangements in the communities, it also shapes them for the purposes of CF planning.

4.3.3. Local land tenure provisions and PGIS processes:

The use of PGIS was found to be of mutual benefit to both PGIS processes and local land tenure. In Cameroon, following the 1974 Land ordinances, all uninhabited forestland without statutory titles belongs to the state. As a result this land has been conceptualised under the generic notion of “communal ownership” (Chi, 1999; Fisiy, 1997). This concept allows for considerable overlap in rights and entitlements. Chiefs who have political and ritual powers do claim some kind of sovereignty over the land. Traditionally, effective ownership and administration comes in three ways. Firstly by virtue of first occupation for very old family

lineages; secondly by community members, either by birth, marriage or co-optation, fulfilling local access conditions to the family lineage elders or traditional councils according to local practice; thirdly, strangers or non-natives pay tribute to the rulers to be granted usufruct in the area. In some areas like BB, there is a huge area on lease to a state plantation company. MINEF staff also reserve the right to issue various kinds of permits for forest exploitation on such lands. In some areas it is common for strangers to interpret the ownership by the state as permission to access the area without question at the local level.

Such competitive tenure can facilitate, delay or mar spatial planning and management, and mapping of forest areas. Negotiations and structuring could be facilitated in a context where local arrangements are less complex. In BB, PGIS provided an opportunity for redress of such land tenure disorder and restored control to BB because most of the farmers in the forest had not fulfilled the local traditional practices for access. As a corollary, the negotiations in the BB PGIS process were much longer than in Tinto. One feature of the BB area, the presence of the leasehold, allowed the community to initiate action to get back land given out on lease by government. In Tinto this is not the case, so such action could never have been taken. Evidence for the Woteva and Nkokom communities in Cameroon (personal experience) show that local ancestral family claims to forestland could easily stall the CF planning process.

4.3.4. History of actor relationships and attitudes and PGIS processes

From the evidence in this study the history of conflicts and the attitude of actors seem to have an important influence on the duration, the character of participation, and the advancement of governance. The sensitivities of various actors influence the negotiations and the planning of the process of consensus building and evaluation. In the case of BB, MCP had to start by working with various actors separately to help them see the interest of working together because of the conflicts. This slowed the process for a reasonably long time. Some amount of sensitisation, education or negotiation is always to be determined in decision-making and the relationships and trust levels are important. The PGIS process in Tinto clearly benefited from good working relationships and trust developed over thirty years. The negotiations in the mapping processes were thus shorter allowing them to gain time and save slightly more resources.

4.3.5. Civil society (NGO) facilitation and PGIS processes

Civil society facilitation had important influences on the operationalisation of PGIS in these communities. As seen in both case studies, NGOs and projects constitute the main facilitators of PGIS in CF. They help provide material and the technical know how and they accompany communities through the process. This inevitably influences some of the activities as the philosophy of these NGOs can be seen in the processes. Greater emphasis on local training for the Tinto case study can be attributed to the predominantly educational empowerment perspective of Living Earth whilst the emphasis on user group approach can be explained by the forest management orientation of the MCP. Both of these have advantages and are both needed for improving PGIS. The absence of information management aspects in these processes can also be explained by the limited experience of both organisations in the area. The resources for PGIS development in most cases were provided by these projects. With these

projects winding up, the sustainability of these projects is to be questioned. On the other hand PGIS was used as tool to improve the overall facilitation process of SFM for these organisations.

4.3.6. Resource availability and PGIS processes

The availability of resources including human, financial and material resources were observed to account for some of the differences experienced in PGIS. A wide range of community resource persons and resources available to the facilitating organisations are crucial to PGIS success as it is long and slow and demands high-tech use in most cases. The limited access to GIS facility and competent human resources can partly explain why the existence of digital GI data for the forest area, the second CF management plan map in Tinto, was done through desk cartography. The reverse is true for BB. Given that they had all the necessary resources they used GIS mapping for the major outputs required by MINEF.

The varied relationships between these factors show that different contexts will impact differently on the trajectory that PGIS takes. More specifically, the way these forces influence good governance dimensions through PGIS in the two case studies become even clearer in the explanations made in the ensuing sections (Results of objective 4 and the discussions).

4.4. Assessment of PGIS Process Using Good Governance Dimensions (Objective 4)

This section presents the results of the evaluation of the CBM process based on five main good governance dimensions including legitimacy (participation and ownership), empowerment and respect for indigenous spatial knowledge, equity, accountability and competence. These dimensions are further operationalized into indicators for structuring the presentation. The results are presented on the basis of a number of major actors.

4.4.1. Participation and Ownership as proponents of Legitimacy

Participation and ownership are the two main elements of legitimacy. The participation element looks further into representation or involvement in key process activities, as well as participation in decision-making. Ownership looks into access to GI and control of GI during the PGIS process.

The results of this dimension for both participation and ownership are summarised into tables and discussed for both cases. Between six and seven main actors were identified in each case study for the assessment. However, another actor (women) has been included in order to pay specific attention to gender in this study. This is because the study found in the case of BB that women constituted about 50% of the forest users. In Tinto they are the main NTFP harvesters. Yet, there was evidence they are not fully integrated into forest decision-making.

4.4.1.1. Participation (Legitimacy)

Participation is made up of representation or involvement in activities and decision-making. They will thus be assessed for both the Tinto and BB cases.

Tinto

Table 4.9 presents a summary of the evaluation of participation and ownership in the PGIS process of Tinto.

Table 4.9: Participation performance table for Tinto PGIS process

Dimension	Indicators	Actors						
		Chiefs	MC	MINEF	LE	FMRs	HTRs	Women
Participation								
Representation and involvement	Representation in mapping processes?							
	a) During the sketch mapping?	✓	✓	✗	✓	✓	✓	✓
	b) During the GPS /Compass data collection?	✗	✓	✓	✓	✓	✓	✓
	c) During the Aerial Photo Interpretation?	✗	✓	✗	✓	✗	✓	✗
	d) During GIS processing?	✗	✗	✗	✓	✗	✗	✗
	E) Involvement in first ever meeting with new actor?	✓	✓	✗	✓	✓	✓	✓
Decision making	Direct involvement in land use allocation and use rights decisions?	✓	✓	✓	✗	✓	✓	✓
	Direct involvement in CF boundary and compartment boundary decisions?	✓	✓	✓	✓	✓	✓	✓
	Direct involvement in ISK inclusion/exclusion decisions?	✓	✗	✗	✗	✗	✓	✗
	Involved in map content decisions?							
	a) Sketch maps	✓	✓	✗	✓	✓	✓	✓
	b) GIT maps	✗	✗	✓	✓	✗	✗	✗
	Involved in map format or representation decisions?	✗	✗	✓	✓	✗	✗	✗

Key
✓ Yes ✓ Partly ✗ No ? Uncertian

MC: Mgt Committee
FMRs: Farmers
HTRs: Hunters

Representation and involvement in CBM process: Table 4.9 shows that most of the stakeholders except MINEF did actually participate in the participatory sketch mapping. A representation of most main groups except the chiefs participated in the GPS and compass surveys. Hunters, LE and MC representatives did the aerial photo interpretation. The GIS data processing and mapping was done by the consultant only, with very little input from Living Earth.
Decision-making: Major CBM decisions such as land use allocation and compartment boundaries were mostly taken in meeting forums after discussions. From table 4.9 one can see that the open debate enabled many actors to take part in major decision-making. There is evidence that MINEF influenced decision-making by advising clearly that the community should reserve space for farm expansion so as to avoid encroachment problems in the near future. As a result a buffer zone was created between communities and the CF (see figure 4.3). A decision to exclude a sacred tree and shrine from the CF area was debated and decided upon by the elders and the group of hunters "local surveyors" who were assigned by the community to identify landmarks for the CF boundary. Content decisions for the sketch map were made by a wide group of stakeholders present during the exercise. But in the case of the GIT maps, both content and format decisions were made exclusively by MINEF and the GIS consultant brought in to do the mapping.

Overall the table also indicates that participation in the PRA tools was more of a popular nature (en masse) whilst in the case of the GIT tools the groups were smaller. Evidence from the study shows that GIT players were delegates chosen by different groups and in rare cases appointed by chiefs.

Figure 4.10 shows the intensities of participation and the purposes of participation attained by the community PGISystem of Tinto according to ladders by Catley (1999) and McCall (1998) respectively.

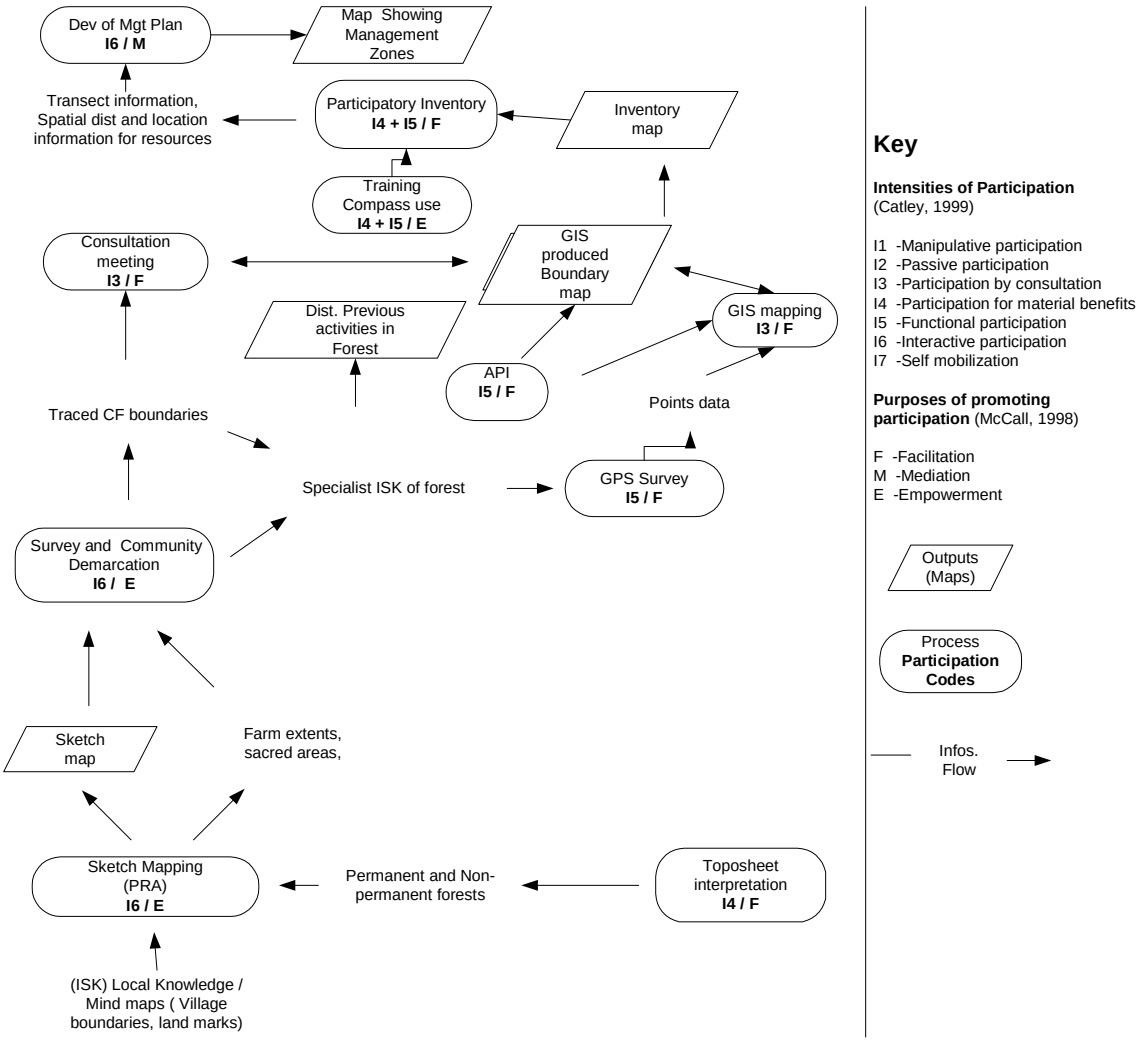

Figure 4.10: Participation Intensities and Purposes by activity for Tinto CBM / PGIS

The figure shows the intensities of participation and the participation purposes attained in the PGIS at the level of different activities. They summarise the discussions relating to participation in the preceding paragraphs. In the case of participation intensities by Catley the higher the number (I1-I5) the better the quality of participation and the greater participation promotes good governance. The ladder by McCall on the other hand, is a continuum of participation purposes getting better from facilitation to empowerment. Therefore, the higher in the continuum, the better the contribution of the PGIS activity to good governance. Details of both ladders can be found in appendix 6.

According to evidence the highest intensities of participation were attained during the Sketch mapping, survey, and demarcation, and the management activities. The participatory inventory, the training sessions and the GPS surveys attained levels between participation for material benefits and functional participation. The rest of the activities mostly attained participation by consultation.

In terms of purposes, empowerment was attained during the sketch mapping and the demarcation activities whilst the management planning activity attained mediation. The rest of the activities employed participation for the purposes of facilitation

Bimbia Bonadikombo

Table 4.10 presents a summary of the evaluation of participation in the PGIS process in the BB case.

Table 4.10: Participation performance of the BB PGIS process

Dimension	Indicators	Actors							
		Chiefs	MC	MINEF	MCP	CDC	FMRs	TE	Women
Participation									
Representation and involvement	Representation in mapping processes?								
	a) During the sketch mapping?	✓	✗	✓	✓	✓	✓	✓	✓
	b) During the GPS /Compass data collection?	✗	✓	✓	✓	✓	✓	✗	✗
	d) During GIS processing?	✗	✗	✗	✓	✗	✗	✗	✗
	Involvement in first ever meeting with new actor?	✓	✓	✓	✓	✓	✓	✓	✓
Decision making	Direct involvement in land use allocation and use rights decisions?	✓	✗	✓	✓	✓	✓	✓	✓
	Direct involvement in CF boundary and compartment boundary decisions?	✓	✓	✓	✓	✓	✓	✓	✓
	Direct involvement in ISK inclusion/exclusion decisions?	✓	✗	✗	✗	✗	✓	✗	✗
	Involved in decision to apply for land from CDC?	✓	✓	✓	✓	?	✓	✓	✓
	Involved in map content decisions?								
	a) Sketch maps	✓	✗	✗	✓	✓	✓	✓	✓
	b) GIT maps	✗	✓	✓	✓	✗	✗	✗	✗
	Involved in map format or representation decisions?	✗	✗	✓	✓	✗	✗	✗	✗

Key

✓ Yes ✓ Partly ✗ No ? Uncertian

MC: Mgt Committee
FMRs: Farmers
TE: Timber Exploiters

Representation and Involvement in Process: The table shows the following, that participatory sketch mapping saw the participation of the main stakeholders except the local MINEF, CDC and the MC. In the case of the MC, their absence is explained by the fact that it had not been created at the time. Representatives from different stakeholders did the GPS and compass surveys, meant for boundary mapping and the participatory inventory respectively. However, only the project GIS staff did the processing of the data.

Decision-making: The major CBM decisions such as land use allocations in the LUP, the CF internal and external boundaries and the decision to apply for land from the CDC, were taken with the involvement of most actors. These decisions were made during the first stakeholder forum wherein participatory sketch mapping was used to make the LUP. Only the chiefs, farmers and MC were involved in relatively small ISK decisions made. However, decisions relating to the PGIS map content and format were taken by partners external to the community, in this case MCP and MINEF.

Figure 4.11 shows the intensities of participation and the purposes of participation attained by the community PGISystem of BB.

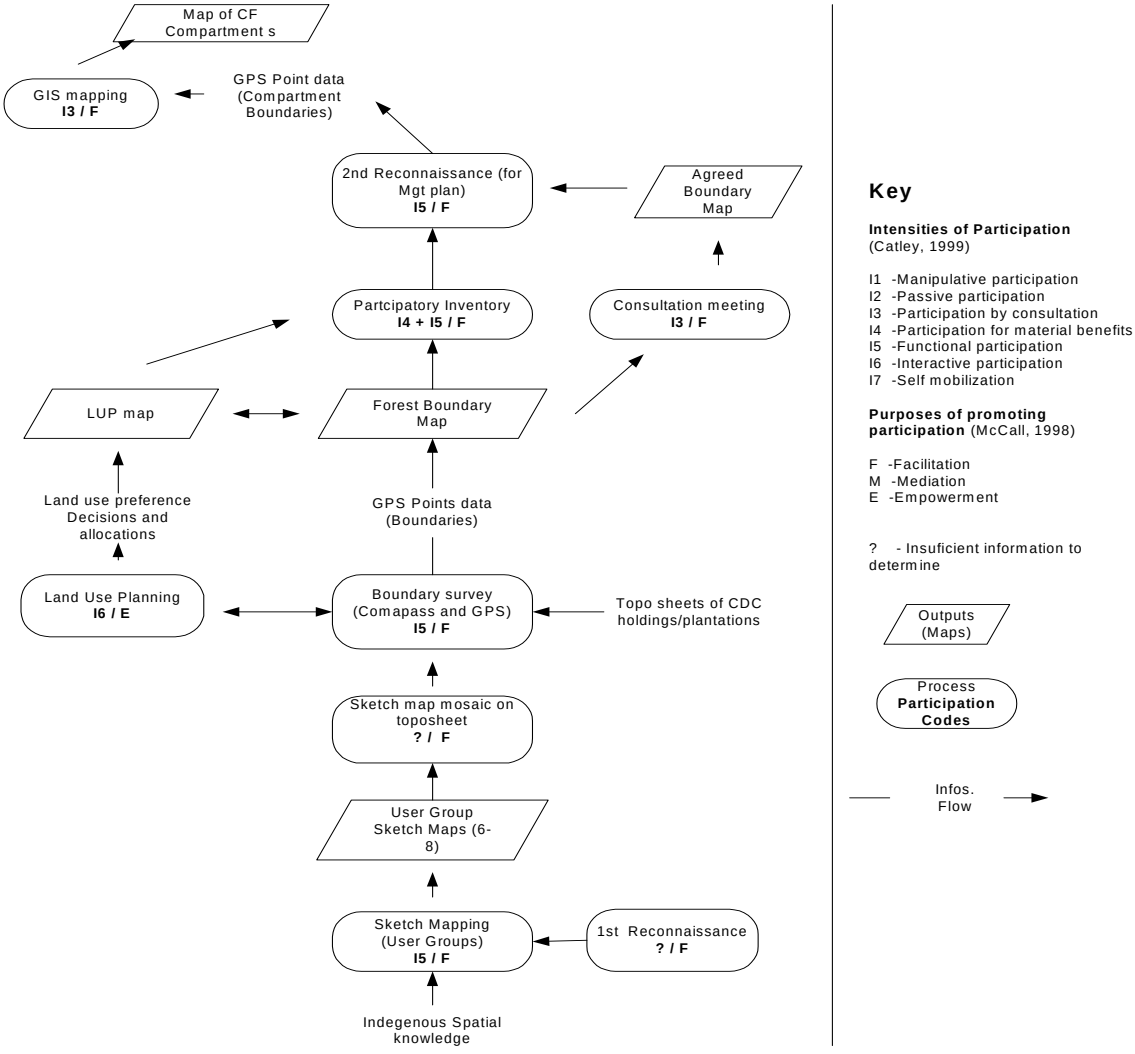

Figure 4.11: Participation Intensities and Purposes by activity in the BB CBM/PGIS process

According to the figure, the highest level of participation (self mobilisation) was attained at the level of the land use planning when the community decided and took action to apply for land from the CDC. The management plan activity shared next highest level with the interac-

tive participation. GPS survey activities and the sketch mapping next achieving functional participation.

In terms of purposes of participation attained, the order remains exactly the same as for the intensities for all activities.

4.4.1.2. Ownership (Legitimacy)

Ownership as a governance dimension in this study has been assessed on two main aspects including access to GI and GIS, and the use of GI. They will be assessed in the ensuing paragraphs for both cases.

Tinto

Table 4.11: Ownership (Legitimacy) Performance table for the Tinto PGIS

Dimension	Indicators	Actors						
Ownership		Chiefs	MC	MINEF	LE	FMRs	HTRs	Women
Access to Geo-information and GIS	Direct access to analogue GI?	✓	✓	✓	✓	✓	✓	✓
	Direct access to digital GI?	✗	✗	✗	✓	✗	✗	✗
	Direct access to GIS facility?	✗	✗	✗	✓	✗	✗	✗
GI use	Hard copy / Printed GI use?	✓	✓	✓	✓	✓	✓	✓
	Digital GI use?	✗	✗	✗	✗	✗	✗	✗

Key
✓ Yes ✓ Partly ✗ No ? Uncertain
MC: Mgt Committee
FMRs: Farmers
HTRs: Hunters

Access to GI and GIS: From the legitimacy table we can also see that analogue GI data in the PGIS was accessible to all in the community in principle. It was located in the FMOs office and with the three chiefs and any community member with good reason could access it. The digital data was only directly accessible to the GIS consultant, as the he remained the only one from amongst the actors with direct access to a GIS facility. LE had very little access to the data.

Use of GI: Only representation functions of GIT were used in this process. PRA maps and GIS produced maps were only to represent spatial information. There is no evidence that any analysis in terms of raster data was used in this case. Mainly Arc view polygon data, sketch maps and topographic sheets of the area were used. In terms of strategic use, the process of mapping enabled the community to look at resources in perspective and to make decisions on land use. For community organisation purposes maps were used in the process as discussion aids for decision-making, properly locating the quarters in the villages for mobilization during activities such as demarcation and for collection of information on population for benefit sharing purposes. It also helped elite living outside the community to know the forest better. Tactical use was limited to the use of the compass and maps during the participatory inven-

tory. Above all it served the CF application process. All stakeholders have been directly or indirectly using the analogue information. No digital use of GI was reported.

Figure 4.12 show GI was used in the various PGIS activities in the Tinto case.

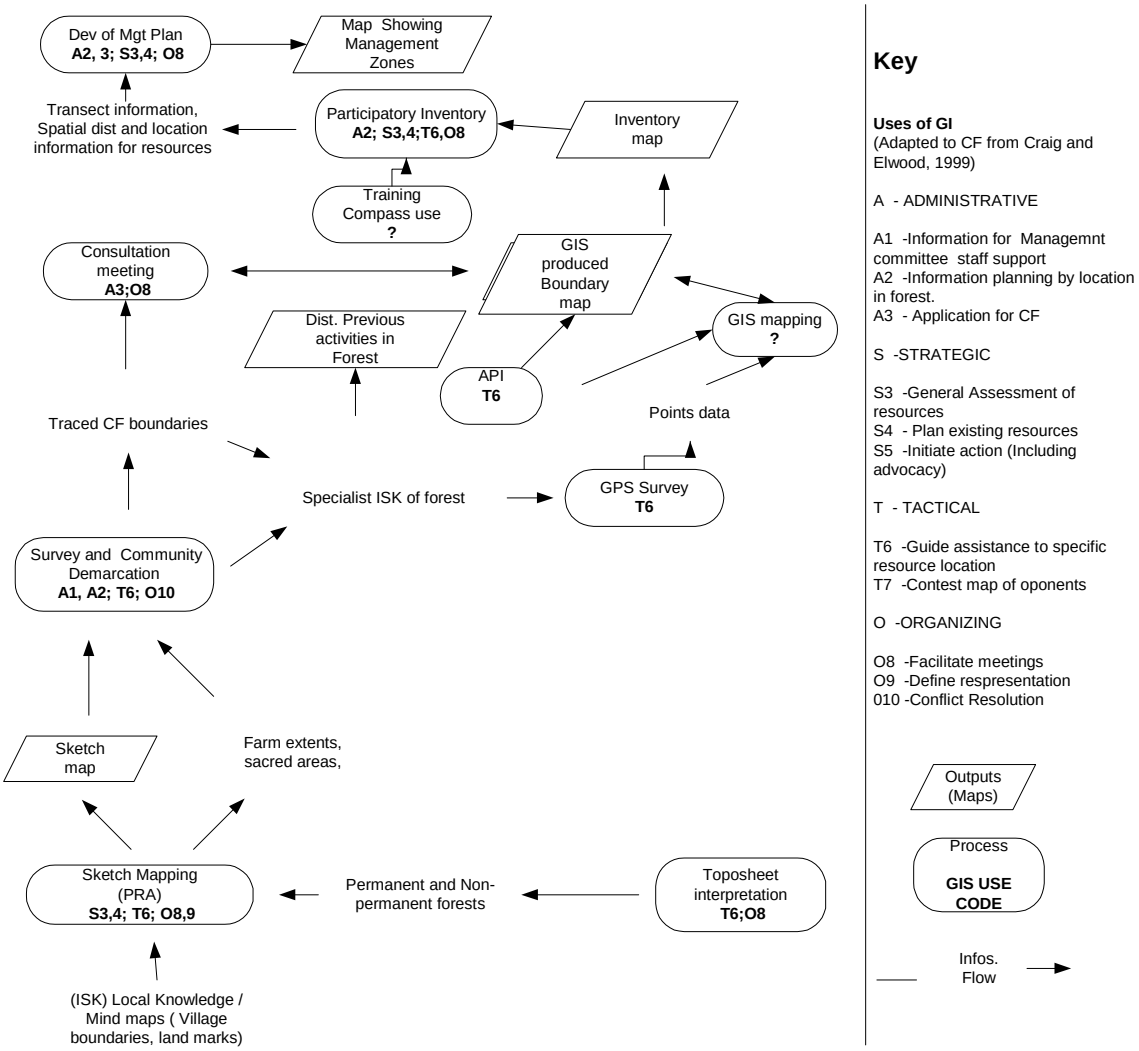

Figure 4.12: GI uses during the Tinto PGIS

The figures show the GI uses based on an adaptation to CF of a framework for organising the uses of maps and geographic information by community organisations (Craig and Elwood, 1998). Basically the more the users and uses of GI the stronger is the PGIS decision-making and, by extension, governance.

Figure 4.13 shows that the sketch mapping, participatory inventory, and management plan activities had relatively higher number of GI uses. The consultation meeting and the topographic sheet interpretation had two uses each. Other activities did not witness strong GI uses.

Bimbia Bonadikombo

Table 4.12: Ownership (Legitimacy) Performance table for the BB PGIS

Dimension	Indicators	Actors							
Ownership		Chiefs	MC	MINEF	MCP	CDC	FMRs	TE	Women
Access to Geo-information and GIS	Direct access to analogue GI?	✓	✓	✓	✓	✓	✓	✓	✓
	Direct access to digital GI?	✗	✗	✗	✓	✗	✗	✗	✗
	Direct access to GIS facility?	✗	✗	✗	✓	✗	✗	✗	✗
GI use	Hard copy / Printed GI use?	✓	✓	✗	✓	?	✓	✓	✓
	Digital GI use?	✗	✗	✗	✓	✗	✗	✗	✗

Key ✓ Yes ✓ Partly ✗ No ? Uncertain

MC: Mgt Committee
FMRs: Farmers
TE: Timber Exploiters

Access to GI and GIS: In the PGIS process in BB, hard analogue GI was more or less accessible to all actors. The FMO is the custodian of analogue GI and any community member for good reasons could use this. Digital GI was only accessible to the MCP project that had the GIS facility. Evidence suggests that the MC through the FMO could access this data upon request. However, from the MCP staff interviewed and the wordings on the maps (figures 13 and 14) "Prepared by the Bimbia Bonadikombo Natural Resource management committee with technical assistance from MCP", ownership by the community is implied.

Use of GI: Only the display/ representation aspects of GIT were used in this process. There is no evidence suggesting that any analysis in terms of raster data use was made in this case. Main Arc view polygon data, sketch maps and an artist's 3-D impression of the area were used. In terms of strategic use, maps provided visual support for appreciation of resource capacity. This was a limited level of analysis done using sketch maps of soils, current use, pressure perception and a future scenario. The mapping process itself turned out to be a process of redressing boundaries as stakeholders made maps of their specific use zones. Which served for conflict resolution at different points. Another use for all the stakeholders at various points in the CBM was to apply for a CF. At these levels almost all stakeholders were involved in GIT use. It was also to negotiate the return of land from the CDC and as support to monitor management activities on a limited scale. The use of the maps during the inventory constituted a tactical use of maps in the sense that it guided action in the forest.

Figure 4.13 show GI was use in the various PGIS activities for each for the BB case

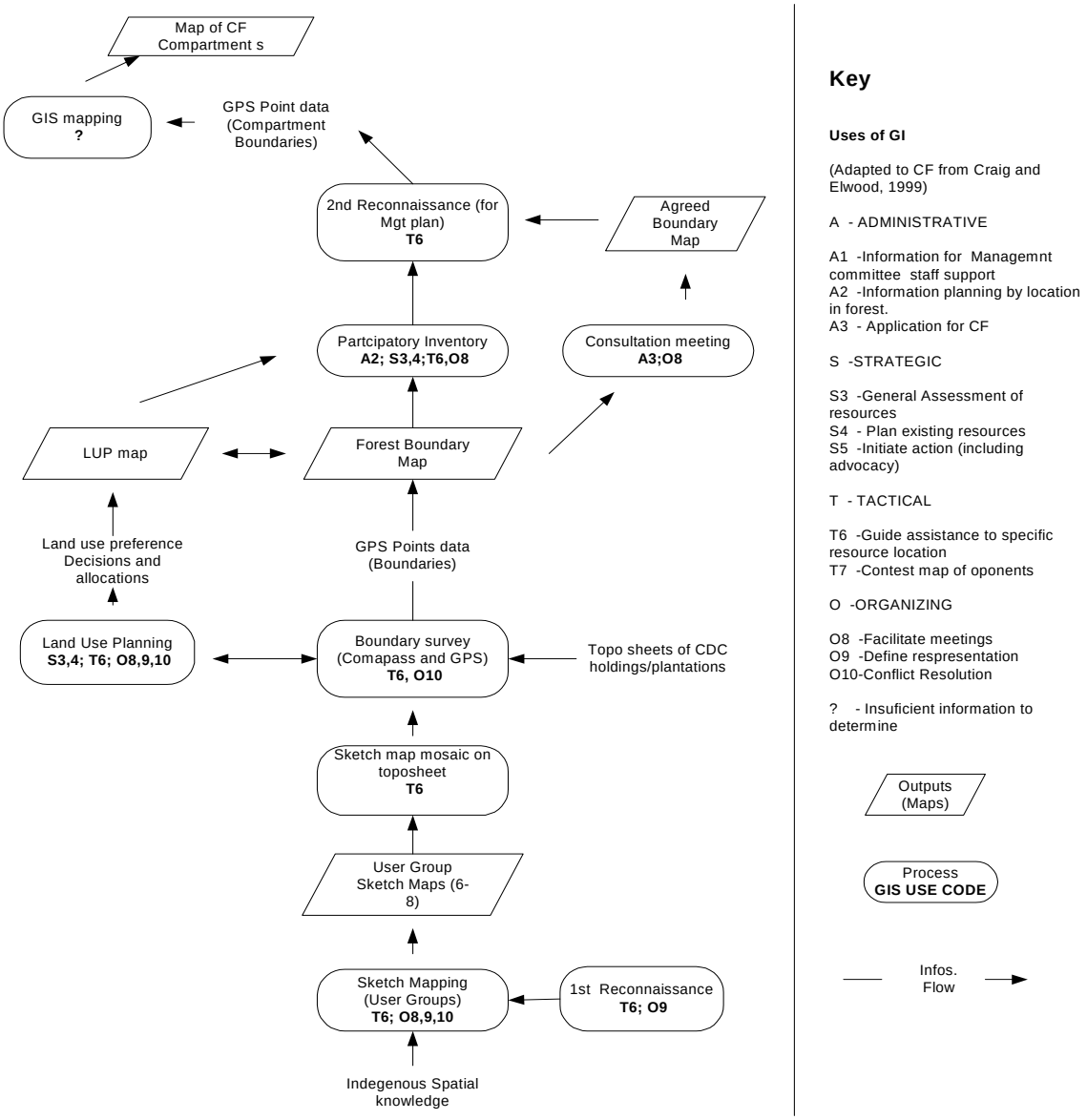

Figure 4.13: GI uses during the BB PGIS

The figure shows that the land use planning, the participatory inventory and the management plan development activities demonstrated a relatively high GI use. Sketch mapping and the consultation meeting sessions were second in importance in terms of GI use. The other activities showed weak use of GI.

4.4.2. Empowerment

This dimension assesses whether the actors were empowered in the process. Three indicators are used including training, learning and recognition and use of ISK in both case studies.

4.4.2.1. Tinto

Table 4.13 shows empowerment performance of the Tinto PGIS.

Table 4.13: Empowerment performance table for Tinto

Dimension	Indicators	Actors						
		Chiefs	MC	MINEF	LE	FMRs	HTRs	Women
Empowerment	Involved in any GI related training?	✗	✓	?	✗	✗	✓	✓
	Evidence of Learning from CBM process?	?	✓	?	✓	✓	✓	✓
	Evidence of manipulation / use/ exploration of ISK?	✓	✓	✗	?	✓	✓	✓

Key

✓ Yes ✗ No ? Uncertain

MC: Mgt Committee
FMRs: Farmers
HTRs: Hunters

Evidence points to the fact that participation in CBM activities using maps of the forest allowed the communities to share knowledge of the area, enabling learning from each other. Most interviewees said they learnt something new about the forest and resources. Specifically women attest to getting to know the village boundaries better and the extent of their forest during the process as a result of using the map in meetings and discussions. A new feeling of limiting the donation of land to non-natives was hatched in the community owing to the realisation that little forest was left in the area. Some community members said they only learnt from the mapping process that one of the three clan villages does not have forest, but they still decided to work together for the sake of unity. Some community members, especially those who participated in the participatory inventory where trained in using the compass and in basic map reading See table 4.13.

As mentioned in the decision-making results in section 4.3.1.1, the independent decision by community members to exclude a shrine from the forest represents a recognition of / respect for local rights and indigenous knowledge and therefore empowerment, because in pre-CBM days the decision to demarcate the area for exploitation would have been made by a MINEF official, ignoring this aspect of local knowledge completely.

4.4.2.2. Bimbia Bonadikombo

Table 4.14 empowerment performance of the BB PGIS process.

Table 4.14: Empowerment performance of the BB CBM process

Dimension	Indicators	Actors							
		Chiefs	MC	MINEF	MCP	CDC	FMRs	TE	Women
Empowerment	Involved in any GI related training?	✗	✓	?	✓	✗	✓	✗	✗
	Evidence of Learning from CBM process?	✓	✓	✓	✓	?	✓	?	✓
	Evidence of manipulation/ use or exploration of ISK?	✓	✓	?	✓	✗	✓	?	✓

Key ✓ Yes ✓ Partly ✗ No ? Uncertain

MC: Mgt Committee
FMRs: Farmers
TE: Timber Exploiters

Many actors learnt from the process. Firstly the community came to a realisation during the LUP that there was little forest left in the area and they decided to ask for land from the plantation corporation for a CF. Evidence suggests that through the discussions they also learnt that natives and non-natives had an interest in protecting the forest and had to work together to achieve the necessary sustainability. This led to the creation of the BBNRMC from VLFCC and VACIG. These two groups were exclusively composed of natives who wanted to keep the non-natives out. The natives and non-natives got a better understanding of their community and it's resources. Few community participants and MCP field staff were trained in the use of the GPS and the compass in the process.

The fact that user groups mapped the use areas themselves in the sketch maps and discussed them during the land use planning allowed the communities to share the knowledge they have of the area thereby empowering each other. Most interviewees said they learnt something new about the forest and resources.

The mobilization achieved by the PGIS process which enabled the BB community to apply for land from the CDC using a map that speaks the language understood by the CDC and government, was to a large extent empowerment.

4.4.3. Equity

In this governance dimension the main element of focus is whether the CBM process influenced power relations. This indicator shows the actor's losses or gains in access or control rights in the PGIS. The assumption is that such changes directly impact on power equations.

4.4.3.1. Tinto

The summary in table 4.15 shows equity performance for Tinto PGIS.

Table 4.15: Equity performance table for Tinto CBM

Dimension	Indicators	Actors						
		Chiefs	MC	MINEF	LE	FMRs	HTRs	Women
Power Relations	Gained resource control powers as a result of CBM decision-making?	✓	✓	✗	✗	✗	✗	✗
	Gained resource access rights as a result of CBM decision-making?	✗	✗	✗	✗	✗	✗	✗
	Lost resource control power as a result of CBM decision-making?	✗	✗	✓	✗	✗	✗	✗
	Lost resource access rights as a result of CBM decision-making?	✗	✗	✗	✗	✗	✓	✓

Key
✓ Yes ✗ No
MC: Mgt Committee
FMRs: Farmers
HTRs: Hunters

As a result of the land use allocation process decision-making, the chiefs and the MC were given control rights for the community forest area. The rules and regulations agreed to regarding access and use in itself constituted a process of community transfer of power to their elected representatives in the MC. Though the chiefs were custodians of the forest they did not have power to introduce access controls or revenue controls. Local MINEF thus lost direct control over parts of the forest in the area. Furthermore, hunters and women who used to have unconditional access for game and NTFPs respectively agreed to restrictions, following debate. Therefore they were net losers of power in the process.

4.4.3.2. Binbia Bonadikombo

The summary in table 4.16 shows equity performance for the BB PGIS.

Table 4.16: Equity performance of the BB CBM Process

Dimension	Indicators	Actors							
		Chiefs	MC	MINEF	MCP	CDC	FMRs	TE	Women
Power Relations	Gained resource control powers as a result of CBM decision-making?	✓	✓	✗	✗	✗	✗	✗	✓
	Gained resource access rights as a result of CBM decision-making?	✗	✗	✗	✗	✗	✓	✗	✗
	Lost resource control power as a result of CBM decision-makning?	✗	✗	✓	✗	✓	✗	✗	✗
	Lost resource access rights as a result of CBM decision-making?	✗	✗	✗	✗	✗	✓	✓	✗

Key
✓ Yes ✗ No

MC: Mgt Committee
FMRs: Farmers
TE: Timber Exploiters

The land use allocation related decisions in the BB case enabled a net gain of resource control for the chiefs, the management committee, and women. Prior to CBM they had lost power and control over the forests to "migrant farmers who occupied without notice or permission". In the CBM process a core area was created, not open to farming or logging, all farmers within the forest agreed to register with the management committee and the MC had to issue permits as well as collect payments for logging activities in the CF area. These decisions meant transferring power that was previously the preserve of the local MINEF staff to the community. With the realisation that these land use decisions had to be implemented with all stakeholders participating, during the LUP, the Bimbia Bonadikombo Natural Resource Management Committee (BBNRMC) was created. This meant stricter control of access rights; therefore net loss of power and access rights for the timber exploiters that came from outside, upto 80 km. away.

4.4.4. Accountability

In this dimension the main indicator sought whether or not mechanisms existed in the CBM processes to guarantee openness and fair play in the CF planning process. Table 4.17 below shows the accountability situation in both cases.

Table 4.17 : Accountability table for the Tinto and BB PGIS

Indicator	Tinto	Bimbia Bonadikombo
Presence of accountability mechanism?	Yes	Yes
Description of Mechanisms	•Election of representatives •Recall /Protest possible on decisions •Conflict resolution mechanism •Reporting mechanism	•Election of representatives •Recall / Protest possible on decisions •Conflict resolution mechanism •Reporting mechanisms

In both the Tinto and the BB cases representatives were elected into the Management committees in charge of planning both CFs, for most cases for representation during meetings and activities. In Tinto where a representation system on a family-by- family basis exists the representatives are suppose to be elected in principle. There is room for a family member to protest to the management committee if they thought a representative was not duly elected.

Such a recall mechanism was present in both CBM processes in the case of the land use allocation decisions as shown on CF maps. They were posted at several public places in the communities for a 45-day period so that all protests could be raised and addressed prior to the submission of the CF application dossier. This is crucial, as the boundaries of the CF on the map will become official once it is agreed at a general community consultation meeting.

Conflict resolution mechanisms were agreed to in these processes for all protests in both CBM processes.
Lastly, periodic reporting to the communities and the MINEF during the process served as a means of keeping actors updated with the process. Reporting formats for MINEF are provided for in policy (MoP), but communities decided on how often the management committee should make activity reports for community use.

4.4.5. Competence (Effectiveness and Efficiency)

Competence has been addressed from two standpoints in these case studies. First, in terms of enhancing dialogue or communication, relationships, and secondly, in terms of actor perception of CBM processes.

4.4.5.1. Enhancing Dialogue and communication (Competence)

In the case of communication and dialogue enhancement the participation table information, transcript information and secondary data is used in a sociogram representation of change.

Tinto

With regards to dialogue enhancement, in the Tinto case, evidence from the attendance lists of the main decision sessions in the CBM process showed that all actors were present at key sessions. This is shown in table 4.9. The table also shows that only the MINEF staff had met and worked with all other actors before the PGIS process. For all other main actors the CBM process enabled them to meet at least one new actor, thus enhancing communication in the CF development process.

Apart from just meetings and discussions with each other, there is evidence that the CBM process introduced changes in the interrelationships between stakeholders. This change is shown in figure 4.14. The figure is a sort of sociogram showing the relationship between key stakeholders before and later in the PGIS process. It is developed mainly from information from the interviews and secondary data. Information is only indicated for relationships for which evidence was available. Thus, there would also be relationships that are not shown for lack of evidence.

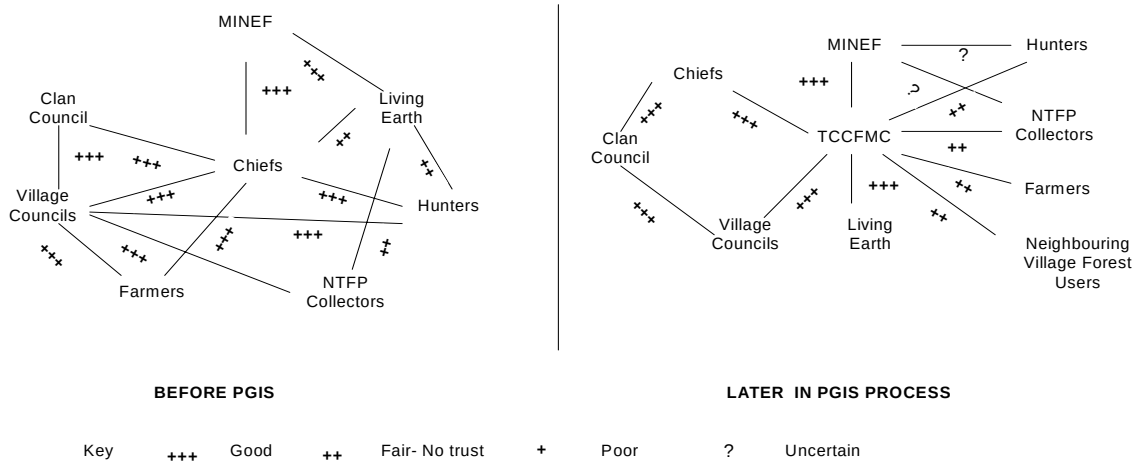

Figure 4.14 Sociogram showing changes in actor relationships during the Tinto PGIS

The figure shows clearly that the structure of relationships and communication changed. Two dimensions are shown using symbols: communication structure change, and an appreciation of the relationship between actors. From a multi-centred structure prior to the PGIS process, to a more coordinated communication structure through the TCCFMC in the later phase of the CF PGIS process. Evidence points to the fact that the decisions to create a more representative structure to manage forest use in the process allowed for better distribution of and understanding of roles, responsibilities and rights. The process allowed for boundary discussions. The resulting spatial plan of the Tinto community forest was to be discussed with users from neighbouring villages because traditionally no use boundaries are set for surrounding forests. Also minimal restrictions are placed, but with a sustainable plan being developed in the process, rules had to be set and users from other villages were thus informed of such changes. Such inter-village discussions on forest use are a rare occurrence.

Apart from allowing actors to meet for the first time, the impact of map use can be clearly seen in the composition of the TCCF-CIG. Its general assembly is made up of family representative from various quarters (see appendix 5b). Maps were used to facilitate agreements and set rules for management between actors in forest space.

This figure also illustrates the changes in power and influence discussed under the equity dimension of governance. It shows that power moved from the chiefs and traditional councils to democratic institution constituted by elected actor representatives called the Tinto Clan Community Forest Management Committee (TCCFMC)

Little change was observed in the state of the relationships between actors (represented by the symbols in figure 4.14)

Bimbia Bonadikombo

With regards to the dialogue enhancement, in the BB case, evidence from the attendance lists of the main decision sessions in the CBM process showed that all actors except the CDC

were present at key sessions. This is shown in table 16. The table also shows that the CBM process enabled all main actors to meet and discuss with new actors.

Beyond just meetings there is evidence that the CBM process introduced changes in the inter-relationships between stakeholders as shown in figure 4.15.

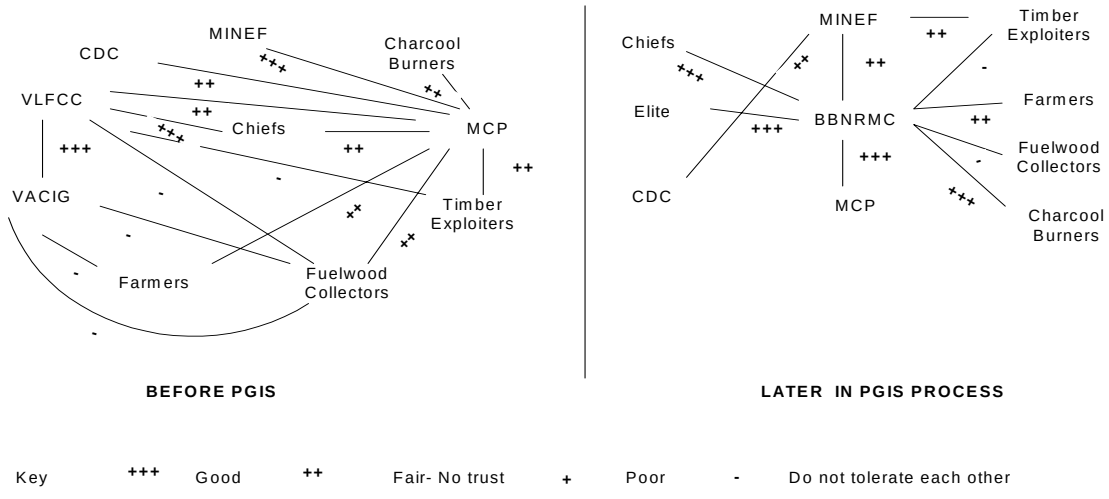

Figure 4.15: Diagram showing actor relationship change in the PGIS process

The sociogram shows two main dimensions, first a change in communication structure, and an appreciation of changes in the state of relationships between actors. In terms of communication structure, it indicates a largely polycentric and conflict ridden situation of relationships in the BB community prior to the PGIS. On the other hand a relatively improved impression emerges in the sociogram done from information later in the PGIS process. It is worth to note that the later PGIS sociogram was made purely from information from a relationship matrix done during a 4Rs tool workshop for the BB forest in 2000 (Tekwe et al, 2001). This is well after the BB land use plan and the first CF boundary map production, but during the third phase of the PGIS process.

Prior to the participatory mapping there was conflict over forest resources, notably between the natives and the non-natives. The latter were considered to be “usurpers” of the forest. The MC chairlady, Hon, Gwendolyn Burnley describes the pre-CBM situation as follows, “So the chiefs brought these young men together to chase them out. There was no code of conduct, there was no negotiation, and no seminars or workshops, no friendship, no discussion, and they were out to fight for what they believed was their right”. Preparatory discussions had been done with these groups separately, in which user group sketch maps were made to express their views prior to the land use plan forum. During the stakeholder conference participatory sketch mapping and a 3-D impression of the area were used to make connections between forest user groups and conflict areas in the forest. Most of them were meeting for the first time to discuss forest issues and they were able to agree, making many decisions. One such decision was to create an organisation representing all stakeholders.

The figure thus shows two purely indigenous organisations at the beginning, the VLFCC and VACIG, with conflicting relationships with many stakeholders prior to the PGIS, and one organisation the BBNRMC showing a marked improvement in relationships with many stakeholders. One reason for the persistent problems with the relationship with timber exploiters is that they come mostly from out of the area, from a radius of about 100 km and was not always part of the PGIS process due to mobilisation problems.

4.4.5.2. Perception of PGIS process

Tinto

In terms of the perception of the process in Tinto, the main positive aspect raised the real value of the use of the GPS and GIS. Those surveyors with knowledge and experience working with timber companies lauded the technology for facilitating the process through the relative ease and rapidity in reading locations and the measurement of area.
On the other hand, the negative aspect repeatedly mentioned during interviews was the difficulty in reading or interpreting Aerial Photographs. Almost all the participants complained of being unable to identify features correctly on the 1:20000 scale photographs. They used phrases like “a little blurred and dark” and “not clear”.

Bimbia Bonadikombo

Regarding the process in BB, a number of positive opinions were raised. A good number of actors acknowledged positively the inclusion of all the stakeholders in the process as a means of reducing conflict. They indicated happiness with the conflict resolution that was brought about through the numerous facilitation efforts of the MCP project to bring all actors together.
A second positive opinion was the visualisation effect created by the 3-Dimensional impression of the area made by an artist. It is said to have helped everyone to understand the area, particularly the natives who have not been engaged in forest activities. Those users whose sphere of exploitation is limited to a specific area could also appreciate the other parts of forest relatively unknown to them.

Though some interviewees mentioned the length of the process as discouraging they also think that it was a very helpful analytical process.

5. Discussion

This chapter discusses the results described in the preceding chapter. For purposes of convenience, the discussion opens with a comparison of the two community PGIS projects, followed by an analysis of the interface between the local level and the higher levels of the forest administration. The second section discusses the above interfaces in terms of output and process. It highlights emerging good governance issues, explains them and comments on some of the differences observed.

5.1. Analysis of PGIS Interfaces

In order to facilitate the ensuing discussions, the community PGIS cases and the interface between the community and the MINEF are presented in two quick reference frameworks. These frameworks are briefly described but they would be mostly referred to in the discussion proper.

5.1.1. Comparison of the BB and Tinto CBM Processes

The results in chapter four are summarised in order to provide a reference framework for comparing both cases. Table 5.1 is a section-like diagram showing four basic phases of a CF PGIS planning process. The four-step process is a model that has been developed from the experience of the author in the field, literature on planning processes (Alcorn, 2000; van den Hoek, 1988) and analysis on this study. The framework shows the tasks that are to be carried out in each of the phases and the key decision points at all phases in the first three rows. The content of these rows and the items of the first column form the basis of the model. This is used to show the differences between the Tinto and BB cases in terms of PRA and GIT tools used, actor involvement, outputs, participation and the timeline of both experiences.
The differential impact of these output characteristics on good governance is discussed below following the GG dimension

Table 5.1 : CF PGIS Planning Model - Including a comparison of the Tinto and BB cases

1995 / Nov. 1999	Preparatory Phase I	Land Use mapping and Planning II	Community Forest Boundary Mapping III	Community Forest Management Plan Mapping IV (March 2002 / Sept 2002)
Tasks	Stakeholder Analysis, Agreement on objectives, Strategic process steps, Choice of mapping Technology to use, Community organisation	Analysis of the current state of resources, Predictions and Land use allocation including CF	Ground Boundary Demarcation Boundary Mapping (Scale 1:50000, 1:200000,for MINEF and 1:125000 - 1:1000 for community use Detailed description of current use of CF area	Multi-resource inventory, Demarcation and delineation of boundary zones, Plant and Animal description, Other M&E inofrmation
Decision Points	How will PSP be carried out? What GI needs are to be met by Maps? How will GI be used / What purposes? How will GI be managed	What proportions of forest will be given to CF? What rights, roles and responsibilities? What ISK is to be included in maps?	CF boundaries Map representation technique and scale, Map Content	Compartment Boundaries, Map representation and scale Map content
GIT Tools	Standard Tographic sheets from MINEF, CDC. Topgraphic sheets, manual transparency overlay.	3-Dimension impression of area, toposheets, MINEF and CDC Topographic sheets	GPS, Compass, GIS mapping using Arcview GPS, Aerial Photo Interpretaation, GIS mapping using Arcview	GPS, Compass in inventory, GIS Mapping Using Arcview Compass training and use in Inventory, GIS mapping using Arc View, Toposheest and desk cartography
PRA Tools	Meetings, conflict mapping, Socio-economic surveys, venn diagrams Meetings, venn diagrams, seasonal calendar, village timelines	User group sketch mapping , participatory land use plan sketch mapping, meetings, transect wlalks, forest reconnaissance Participatory sketch mapping,transect walks, forest use matrix, CF area use map,	Meetings, Participatorysketch mapping for description ,Meetings, Participatory Sketch mapping for forest decsription	Participatory Inventory, Workshops, meetings Participatory inventory, workshops and meetings
Actors	MCP, MINEF, Chiefs, LUC LE, Chiefs, MINEF	Farmers, Hunters, Timber Exploiters, charcoal burners, Fuelwood collectors, VLFCC, VACIG, Women, LUC,MCP,MINEF, MINAGRI,Chiefs,CDC and Elite LE,MINEF,Chiefs,Hunters,TRC,Community Quarter / village representatives, women, MC	Village User group representatives, MINEF,MCP 14 hunters -five nominated by each village, GIS consultants,LE,MINEF	Village user group representatives, MCP, MINEF 23 inventory team volunteers from three villages, LE, MINEF, Forestry consultants
Outputs	Socio-economic study report, Village study report, Seasonal Calendar	User group sketch maps, perception map for pressure, current use, soils, farm extents, land use plan sketch map, transects/cross sections Village sketch map	GIS produced CF Boundary Map GIS produced CF Boundary map including other land use zones, transect or cross section, sketch map describing current forest use	GIS produced compartment / management zones map Map showing compartments / management zones / Desk cartography
Participation Intensity	Consultation Consultation	Initiating Action Decision making	Interactive Interactive	Decision making for zoning Decision-making for zoning

Key Bimbia Bonadikombo | Tinto

5.1.2. Community Forestry PGIS and MINEF relationships

The community PGISystem is inextricably linked to the higher levels of MINEF. This relationship is summarised in figure 5.1 below. The GI requirement for CF explained section 1.3.2 constitute one of the main reasons why CF PGIS for planning is linked to MINEF.

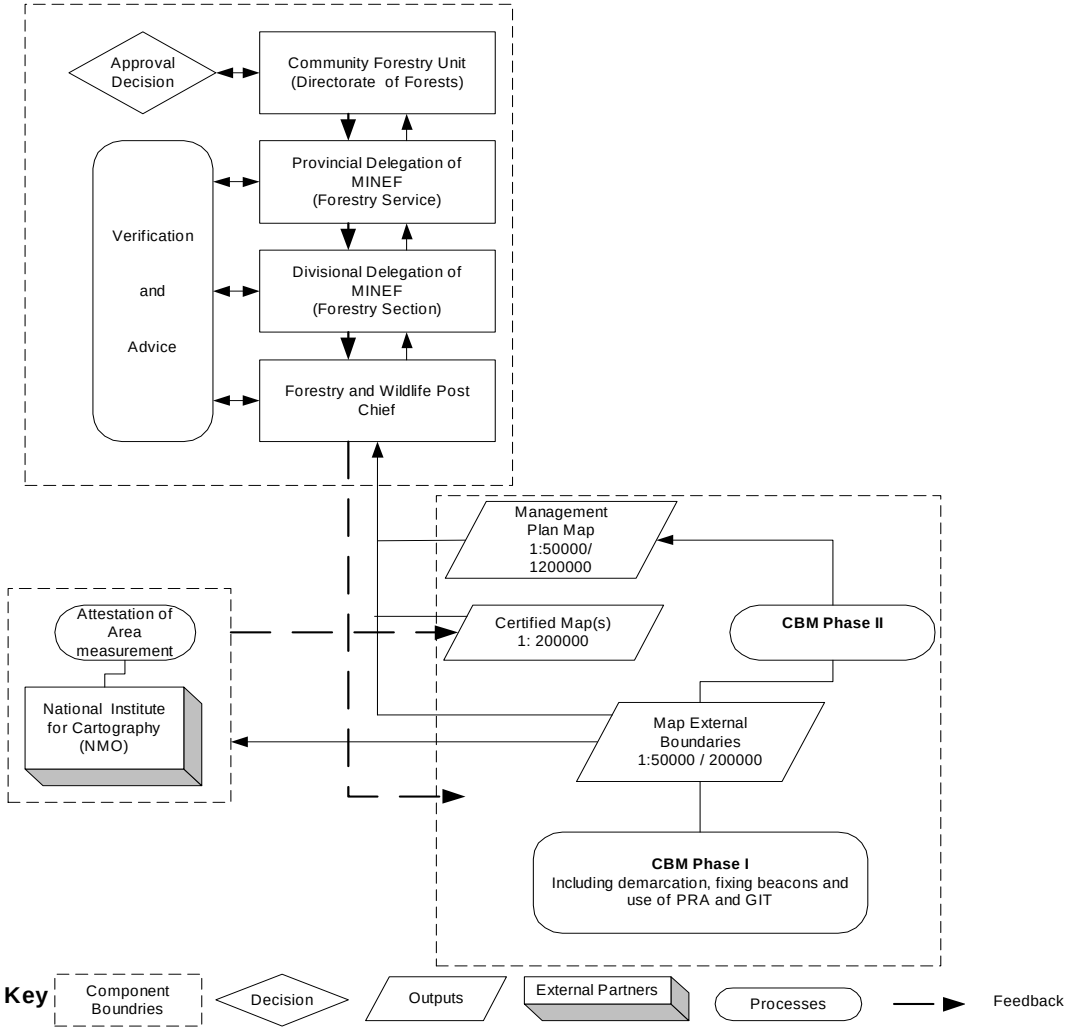

Figure 5.1: Illustration of Community-MINEF PGIS interface

Figure 5.1 shows the two main components being discussed in this section (CF PGIS and MINEF) and the National Institute for Cartography (NIC) subsytem and the GI exchanges between them. MINEF on the upper section demands that communities through PGIS prepare and submit GI at different stages in the application for a CF. Outputs include an external boundary map and a management plan map. These outputs/maps that are exchanged between these systems have been shown in the figure above. The scales of these maps are to be either 1:50000 or 1:200000 (MINEF, 1998). Other additional supporting outputs demanded include a description of previous uses of the forest, an 8% inventory report of the forest establishing baseline data for CF monitoring of forest resources including location. GPS or chain or distance data is to be recorded as well. One condition emphasised and followed strictly is the fact that these maps must be done through a participatory process.

This information is checked and approved by MINEF at various levels. If found to be OK a decision is made at the Directorate of Forestry and the dossier is sent back through the same process as shown on

the feedback loops in figure above. A CF management contract is then signed between government and the community.

5.2. The PGIS Process and Outputs

In this section the outputs are discussed from two angles of governance, effectiveness as an aspect of the competence dimension and legitimacy.

5.2.1. The PGIS process and Output (as a proponent of competence in good governance)

A close look at the two case studies reveals differences in the outputs produced during both PGIS processes. These differences can be explained by the differences in tools used and participation characteristics. In both cases, all three outputs fail to meet some of the planned development activities for the community forest such as indicating tourism sites and eco-tourism trails. Other operational monitoring and evaluation information desired by the community is only partly met in both cases. Compared to the MINEF objectives or the NGO objective the community objectives are not fully met (see tables 4.5 and 4.6). This can be attributed to the level of participation at the planning phase of the PGIS. In both cases it was limited to consultation with community members and there is no evidence suggesting that all actors met and agreed to why the maps were being done and of what use they would be. As a result the facilitating NGO designed the process to meet the MINEF GI application requirements for CF. A good number of interviewees mentioned that these maps were made for MINEF and they might have to plan and do the relevant maps for implementation and M&E.

This raises monitoring and evaluation CF information discussions that are beyond the scope of this study, however it is deemed a necessary part of the planning process. Alcorn, (2000) argues that strategic questions such as why are the maps being made and for whom? Are important in determining the map content and characteristics. In this case these issues were not addressed from the beginning and even in the third phases of both processes where in these objectives should have been met under planned activities the, GIS technicians basically considered the MINEF prescriptions for the mapping without community involvement in the map content or format decision-making. The aforementioned reasons explain the restricted use and usefulness of GI in current CF planning to strategic and community organisation purposes. The outputs are less useful for tactical and administrative purposes (see figures 4.12 and 4.13). Other intermediary outputs such as the seasonal calendars, Venn diagrams and transect cross-sections were very helpful strategically in the negotiation and discussions during decision-making. In BB the user group sketch maps were useful in bringing the stakeholder views to the fore.

A striking common feature is the land use plan. It is an important output in the BB case and the analysis reveals that it constitutes the main feature in the CF boundary map in the Tinto case (see figure 4.3). In the policy prescriptions by MINEF no mention is made of land use plan maps, neither is land use planning mentioned as an activity (MINEF, 1994; MINEF, 1998). However, in BB it was considered a complete phase and a land use plan map made. In Tinto it was done as part of the delineation process and part of the CF GIS produced Boundary map. Evidence suggests that local tenure concerns, issues of resource availability and other concerns mandated land use planning analysis in the process in order to allocate land for CF. Something government did not address at the time of developing the policy. The community concerns and issues are reflected in the some of the community GI objectives (table 3.1) such as allowing enough land for farm expansions in the case of Tinto, and ensuring that there is some area of forest exclusively under indigenous control in the case of BB.

suring that there is some area of forest exclusively under indigenous control in the case of BB. These arguments justify the inclusion of land use planning in the CF PGIS planning model suggested in this study (Table 5.1).

Nevertheless, within the land use planning processes there were differences. In BB it was a very focused and targeted activity whilst in Tinto it was a rather natural occurrence. In BB specific analysis was done though on a very small scale, using sketch maps for soils, perception of pressure on forest and current situation of forest use (see figures in appendix 5a), a 3-D impression of the state of resources and maps from the CDC before coming up with a final land use plan. In terms of GIT use there was tremendous opportunity to improve this kind of "pseudo MCE analysis" because satellite images of the area and GIS facilities were available to the project at the time. Though not requested by government, evidence points to land use planning analysis as one of the most useful in negotiation, conflict resolution, learning and planning than any other activity. In the BB case the land use planning emphasis helped the community see the need for land and took action to reclaim land from the CDC. In Tinto the discussion around these issues were useful but not as structured and organised as in BB. Similar experiences in community MCE analysis using GIS were shown to be equally helpful in forest planning decision making in Kofiase in Ghana (Kwaku-Kyem, 2002). Theoretically this aspect of the BB approach is more logical in participatory spatial resource planning terms (Sedogo, 2002; van den Hoek, 1988), hence its inclusion into the PGIS for CF framework as one phase of its own

5.2.2. Recognition of Community PGIS outputs (Legitimacy)

It is stated in policy that communities must receive an attestation of surface area for their proposed CF from the NIC (figure 5.1). Presumably to ensure that they do not go beyond the 5000ha limit per CF. However at the level of the NIC a topographic map of the area is extracted and desk cartography is done to indicate key reference points and bearings following the PGIS produced CF boundary map. This toposheet extraction is certified along side a written description (See appendix 5c for samples of these products). These are the products accepted by MINEF and not the actual CBM product. This can be interpreted as lack of trust for the PGIS outputs although they constitute the basis on which the NIC does the desk cartography. In these cases local MINEF staff were involved in the PGIS processes that produced these maps yet they were still not trusted by MINEF at the level of the Ministry. In addition, PGIS products are yet to be legally recognised. Brown, (2001) argues in an experimental case in Mukoko in the MCP project area that the involvement of NIC personnel in the mapping process at local level may help induce trust. This however could not be tested because the application file for this community is yet to be submitted. This might also introduce extra cost for community PGIS. There is also a danger that such personnel may distort the community view.

Nevertheless, actors argue that the process itself remains very helpful and local government officials consider them very useful resource management tools. In the BB case, the sketch land use plan was the basis of a sub-divisional order on illegal exploitation of the forest and has also served as a negotiation tool with the CDC through the Senior Divisional Officer of the area. This is proof of the value of the outputs at the local level. The opinion of most of those interviewed during this study in the communities, suggest that they hold these outputs high and valuable (see section 4.2.3) Their involvement in the process, particularly in deciding on names, boundaries, and the output representation of indigenous spatial knowledge seem to be the factors that institutionalise these outputs at local level. These

maps speak the spatial language understood at the higher levels unlike traditional PRA sketch maps. This makes them great symbols of empowerment for local communities.

5.3. The process and good governance dimensions

This section discusses the issues arising from the PGIS interface analysis in relation to good governance dimensions for both PGIS processes. In this section the issues are discussed mainly under six dimensions, participation, ownership, empowerment, equity and accountability. This is due to the fact that the issues arising form the competence dimension seem to make more sense when discussed with those arising from the dimensions mentioned in the preceding sentence. This further underscores the difficulty in separating these dimensions in real world analysis.

5.3.1. Participation and the process (A component of Legitimacy)

Generally speaking the involvement of stakeholders in both cases were fairly interesting, spanning through all the levels of most participation ladders (see figures 4.10 and 4.11). However the BB case got to a higher level of initiating action on a decision to apply for land from a state plantation company.

More popular participation was experienced for PRA tools whilst GIT tools worked more with representatives in both cases studies. This perhaps raises questions regarding the legitimacy of the outputs generated by representatives in instances of the GIT tool use. In both cases there would be a considerable number of illiterate persons in the communities (35%-Illiteracy rate in Cameroon) who may not be capable of reading standard map representations. Those participating in the GIT tool sessions were literate and were comfortable with the standard map representations. From PRA work, symbols have been found to be friendlier to illiterate persons than conventional map representations. This further highlights the crucial nature of the issue about who should decide how the objects of mapping are represented raised in the process and output section.

Fundamentally, in terms of the approaches taken towards participation, Bimbia Bonadikombo applied a forest user group approach in which stakeholder groups were considered as entities alongside chiefs and constituted institutions like MINEF, MCP and others. Though these users came from various villages, they were not seen as villages except in the case of representation on the BBNRMC operations committee. This was adopted for most meetings. On the other hand, in the case of Tinto most representation was on a village-by-village basis. For most activities participants were village delegates from the three villages on an equal basis. The TCCF-CIG is based on elected family representatives. In Tinto, the only exceptional consideration for user groups was the hunters who constituted the group of "surveyors", but again they were 15 of them coming in as delegates for the three villages (five from each village).

In terms of good forest governance and or SFM aspects such as decision-making, respect for rules and monitoring, the user group approach may be more relevant as its impact is direct. On the other hand, in terms of common property such as forests resources, from a benefit sharing perspective, the equal representation on a village-by-village basis might be more acceptable. Otherwise it might just be "politically correct" but not that helpful in contributing to SFM. Both approaches thus could promote good governance. Together they accommodate a political reality of local communities in terms of equal representation and also cater for on-the-ground user management issues crucial for sustainability.

Map scale prescription is one policy aspect that directly influences PGIS process participation in CF. The allowed scales of 1:50000 and 1:200000 are hardly good enough for work in communities. They are difficult to work with in large groups. Scales of between 1:12500 and 1:1000 have been found to be appropriate for local level planning (Eagles, 1984; Groten, 1997; van den Hoek, 1988). Moreover an additional strength of GIS is to produce maps of varied scales and content to the requirements of various actors and purposes from the same data set. But in these cases for the most part these considerations were ignored. In the Tinto case a 1:25000 map was produced for community use in four parts and then glued, but could not be reproduced in colour due to unavailability of colour copy facilities. In the BB case there is no evidence that this was the case. On the contrary the compartment map available is at a scale 1:100000. Every other map conformed to one of the prescribed scales. Working with such small scales can inhibit participation in the PGIS process. This study found out that actors complained of being unable to read the 1:20000 Aerial photos in Tinto during the API. If participation is to be maximised, then the right scales of GI should be used in PGIS (McCall, 2003). These arguments justify the inclusion of appropriate community use scales in the CF PGIS planning model.

5.3.2. Ownership of the outputs and of the process (Legitimacy)

Control and ownership of the process and outputs are critical if PGIS is to promote governance. In these cases control was largely in the hands of the facilitating organisations including the choice of tools, content of CBM outputs and technology to be used. Most planning considerations only involved communities by way of consultation. However, in the CBM outputs produced in the BB case it is clearly expressed that the BB community made the product (figures 4.7 and 4.8). This is good practice for enhancing ownership.

In both cases no due consideration is given during the process to GI access, use and storage issues. These are relevant issues for power, advocacy, institutionalisation and decision-making regarding forest and land use (Alcorn, 2000; Man, 2000; McCall, 2002a; van den Hoek, 1988). As a result, an important GIT tool like the 3-D model used during the land use planning workshop in BB cannot be found anymore, despite its valuable contribution during the PGIS process. The digital data outputs from the process are not easily accessible to communities that need it most to support SFM. Furthermore, the custodians, i.e. the consultant in the case of Tinto and the organisation that inherited the MCP archives (the Limbe Botanic Gardens and Conservation Centre) have no restrictions for future use of this data. With the emergence of GIS consultancies and the potential availability of financial resources from CF management in these communities, coupled with the awareness of the potential of GI in CF management generated by this process, one might well argue that it might be useful for digital GIS data layers to be left with the community on CD to enable future use as the need arises. This might well reduce the cost of PGIS in communities in the long run as a database will be created.

In terms of GI use there is a strong relationship in these cases where the highest intensities of participation and purposes are achieved in activities where the most use of GI is made (see figures 4.11 – 4.14). This supports the findings of (Kwaku-Kyem, 2002) that improved communication and better relationship building is achieved with greater use of GI. Taking advantage of analytical and presentation facilities of GIS in future PGIS may well help promote these dimensions of governance in these communities even better.

5.3.3. The process and equity

Regarding equity issues, both communities did pay some attention to women in the process, by ensuring that they were invited and represented during most activities. In both cases women participated more in the meetings in the villages than in in-forest activities such as GPS surveys and inventories. In BB statistics show that women make-up more than half of the users of the forest (RCDC, 2002)yet from the lists of participants at key meetings less than a quarter of the participants were women. In Tinto, there is evidence that women are the main NTFP harvesters (Minang, 2000) yet women are not involved in the PGIS process in a user group capacity. This could be disadvantageous for conflict management in the future should they violate agreed management rules made in their absence or without a legitimate group representative. There is equally no evidence to show that special attention was paid to involving women in forest based PGIS activities or to support women during the negotiations as a disadvantaged group. Other PGIS experiences have revealed that specific attention to disadvantaged groups helps restore some degree of equilibrium in the balance of power in natural resource planning negotiations and decision-making (Lescuyer, 2001).

5.3.4. The Process and Empowerment

Whilst evidence suggests that there was considerable empowerment of both communities through training, involvement in decision-making and learning, there were differences with regards to how much each community learned in the process. Training contributed better to empowerment in the Tinto process whilst the degree of analysis and involvement in the decision-making process was better in the BB process. The decision and act of initiating a land reclamation process from a state plantation company by the BB community can be considered a direct result of community empowerment through PGIS.

In terms of training there was a more structured and formal training for community members on basic map reading skills, compass use and inventory techniques. There is no evidence of such formal training in BB, rather there is evidence regarding some spontaneous field exercises of GPS and compass use with community members. There is evidence from a later experience in the MCP site and literature that such training helps improve participation and sustainability of PGIS as it enhances community ability for independent applications (Ekwogge et al., 1999; King, 2002; Kwaku-Kyem, 2002). Community members interviewed attest to knowledge and skills acquisition in the process through participation.

The BB community clearly emerged empowered by the PGIS. They were more aware of the state of resources through the PGIS process after the land use planning and as such immediately decided to apply for land previously on lease to the CDC to be returned to them so they could use as part of their community forest.

One other important emerging empowerment capacity of the PGIS process is the support it provides to changing actor relationships. Figures 4.14 and 4.15 show that communities emerge from the PGIS process with a more coordinated stakeholder relationship structure for forest management. Evidence shows that the participation intensities and purposes attained as well as GI use in various activities directly supported communication and dialogue in many ways, thereby influencing the actor relationships positively in both cases. Alcorn and Brown report similar results in community mobilization in resource management.

5.3.5. The process and accountability

One policy prescription that supports transparency in good governance is the 45 days publication of the external boundary map in public places in the community under the supervision of the local MINEF staff. This is a strong requirement that further ensures that all conflicts over tenure are resolved in the intended CF area. Any objections to the boundaries can be raised and addressed in good time.

There is also a built in accountability mechanism in the relationship between MINEF and the community. Within six months of submission of the application dossier MINEF must clearly explain to the community in writing if the application is being refused as well as prescribe actions for redress by the community to make the application acceptable. The CFU however has in most cases sent a team to the field to check boundaries and consensus with the community. This introduces a new dimension to dialogue that never existed before in forest management in Cameroon. These aspects enhance the competence dimension of governance. However, direct participation in PGIS is limited for the most part to local MINEF staff.

The reporting, conflict resolution and benefit sharing mechanisms came in through the PGIS process. They constitute an important new step in further developing accountability and transparency in community forest management.

This chapter compared both PGISytems for the communities as well as the interface between the community PGIS and the MINEF by using a four-phase CF PGIS planning model. Based on the comparison, emerging good governance issues were highlighted, discussed and commented upon. This process in it self, further revealed the high interconnectedness between the output indicators and the governance dimensions used in this study.

In the next chapter the lessons from the analysis are presented as conclusions and recommendations of this research.

6. Conclusions and recommendations

This chapter presents the conclusions of this study in the light of the research objectives, followed by the recommendations for Participatory Geographic Information Systems improvement and further research. It begins with a reminder of the objectives of the research.

6.1. Study Objectives

This study set out to assess Participatory Geographic Information Systems for local Community Forestry (CF) planning in Cameroon using good governance dimensions. Specific objectives are

1) Describing two CF PGIS experiences in Cameroon
2) Assessing how the outputs from the PGIS meet the GI needs of the actors
3) Identifying and describing the main factors influencing the trajectory of the PGIS process
4) Assessing whether or not and how the PGIS process promotes good governance.

6.2. Conclusions

The findings and analysis from this study support the following conclusions relating to the research objectives and the assessment framework.

► *Objective 1:* This study was able to describe in sufficient detail CF PGIS for both the Tinto and Bimbia Bonadikombo case studies by developing and using a four phase CF Planning PGIS model (tables 4.2, 4.4, and 5.1), and PGIS good governance indicators (tables 3.1 and 3.2), based on PSP theory and literature. The four phases consist of preparation, land use planning and mapping, CF boundary mapping, and CF management plan mapping. The main elements of the four phases that emerged were tasks / activities, decision points, GI tools, PRA tools, actors involved, outputs and participation intensities. CF planning PGIS conceptually was done from a broad community land use planning to more specific CF management plan process in both communities though they were facilitated by different NGOs, had different environments and different mix of actors. See figures 4.1 and 4.5, tables 5.1, 4.4 and 4.2 for descriptions. Stakeholder analysis, community perception evaluation and land use allocation of resources and forest management planning were done in an iterative manner. Slight differences were observed in the PRA and GIT tools used. Participatory tools found useful were sketch mapping; transect walks, interviews, group discussions, workshops, resource matrices and venn diagrams. GIT use was limited to representation purposes with few raster analytical functions used. GPS surveys, compass, GIS (Arc-view), API, 3-D models and manual overlays were the GIT found useful in CF planning PGIS. Main outputs included sketch maps and GIS produced maps of scales between 1:25000 and 1:200000. Other relevant intermediary outputs such as cross sections, resources matrices and group perception maps were equally helpful. Actors spanned all community groups, NGOs, and the MINEF.

►*Objective 2:* Most of the main outputs assessed met between half and three quarters of the GI needs of the actors (Community, MINEF and NGOs) for which they were made (tables 4.5 and 4.6). The outputs also represented useful local knowledge (tables 4.7 and 4.8). The main objective not met were the community interest to identify forest management activity locations for tourism such as caves, trails etc. The GI on outputs from this planning process did not cater for expected future community planning, monitoring and evaluation tasks, both in terms of content and scale. Though some of these outputs were government requirements, they were found not to have full legal recognition at the higher levels of government. The actor opinions indicated that participation constituted a strong aspect of the institutionalisation of the outputs at the local community level. These outputs remain valuable to communities because they participated in the process of making them, the products represent some local knowledge hitherto not found in maps, and they enabled communities to speak the same spatial language as government.

►*Objective 3:* In terms of factors influencing PGIS, six interrelated factors were identified and described namely; CF policy, the degree of community organisation / institutional development, local land tenure provisions, NGO facilitation of PGIS, the history of actor relationships and the availability of resources in descending order of importance. These factors could either have a negative or positive influence depending on the context (see chapter four section 4.3). Whilst the influence of CF policy is a constant factor in both communities, the influence of other factors on the trajectory of PGIS are highly context driven, notably as with the degree of community organisation, local land tenure arrangements and the history of relationships between actors. In terms of governance, PGIS processes reciprocally influence some of these factors such as community organisation, actor relationships and local land tenure through the process.

► *Objective 4:* In terms of whether or not, and how, PGIS experiences promoted good governance, the following conclusions were made.

1) That PGIS promoted good governance by adhering and subscribing to different levels of participation including decision-making, empowerment, and action. Allocation and land use planning decisions beyond CF were made in both processes, furthermore, one community initiated action towards land claim from a state corporation.

2) That PGIS supported good governance by; **first,** positively improving communication and dialogue through dynamic CBM and GI use which supported participatory forums, thereby leading to better understanding amongst and between actors, conflict resolution, and coordinated actor decision making; **secondly** by redress of access and control rights through joint land use planning and forest use decision-making, thereby impacting on community power relations; **thirdly,** by bringing women and other community members to the fore of decision-making; and **lastly,** by actor empowerment through training, local knowledge recognition and use and exposure to different levels of analysis using GI, thereby improving community capacity for informed decision-making and implementation.

The ensuing paragraphs address the specific findings (relatively detailed) on the governance dimensions relating to the conclusions in the preceding paragraphs.

Participation (Legitimacy): In both cases most of the actors were involved in activities and decision-making. In Tinto participation attained a high level of interaction. The BB community went a step further in the participation ladder, to take action by initiating a process of reclaiming land from a state corporation for their community forest. Participation in the PRA tools was more widespread in character, whilst for the GIT tools the participants were selected representatives of the groups. In both cases, popular meetings made the fora for analysis and decision-making. There was evidence that some effort was made by the NGOs and communities to involve women in the PGIS process. Participation in decision-making relating to map content and format for CBM outputs was exclusively that of "experts" (consultants or project experts). Figures 4.10 and 4.11 and tables 4.9 and 4.10 present summaries of participation in both cases.

Ownership (Legitimacy): Access to GI (maps mainly) was relatively easy for the community through the CF management officer in both cases, but digital GI facilities and information access was difficult if not impossible (Tables 4.11 and 4.12). Essentially GI was used for strategic and community organisation purposes. Tactical and administrative uses were not prominent in these cases. More specifically, both communities used the maps for land use planning, in the CF application process, in conflict resolution, and for choosing representatives. Another noteworthy use resulting from the PGIS process in BB was to use the map to apply for land claims to a plantation corporation through the government. Figures 4.12 and 4.13 show the various uses of GI during the PGIS process in both cases.

Empowerment: There was widespread evidence of learning (knowledge and skills acquisition) through participation and more formal training offered in the process. As a direct result of the community participation in the PGIS processes, the Bimbia Bonadikombo community initiated a process through government to get back land given to a state plantation in the area for CF. Evidence from the Tinto case revealed that community participants carefully considered, manipulated, and sought protection of important ISK in the process.

Equity (Gender): In the PGIS process decision-making, some actors lost resource access rights or control powers whilst others gained powers, influencing a change in the power equations in forest resource governance (Tables 4.15 and 4.16). Most notable in both areas is the fact that through the PGIS planning process, new democratic structures emerged charged with the responsibility for managing the CF and giving disadvantaged groups including women a voice in decision-making. Evidence shows that special attention was given to the involvement of women.

Competence: PGIS processes were found to have provided a platform for and facilitated first ever meetings between stakeholders in the communities. By bringing stakeholders together, PGIS helped build relationships and institutions. Sociograms for pre-PGIS and later PGIS stages in both communities showed that the communication structure and actor relationships changed through the process (see figures 4.14 and 4.15).

►*Regarding the methodology* of the study, it is important to note some conclusions given that this is one of the few studies that have operationalised good governance dimensions and indicators in the assessment of PGIS processes. Firstly, good governance dimensions and indicators were proved to be useful in the description and assessment of complex PGIS processes in detail. However, significant

problems can exist in trying to separate the content/substance covered by the various governance dimensions. Few dichotomies exist in this sense. Indicators suitable for one dimension seemed to fit easily and with reason equally well into other dimensions. Another weakness is the very contextual nature of the analysis, reflecting the governance debate of what is qualified as "good" or "bad" governance. Nevertheless great opportunities exist for the development of better indicators especially within the context of forest sustainability.

6.3. Recommendations

Two groups of recommendations emerge from this study: recommendations for CF PGIS improvement (in order to CF and good forest resource governance – figure 1.1) and recommendations for further research.

6.3.1. Recommendations for CF PGIS improvement

►Participation in PGIS should be introduced at the very beginning, when PGIS preparation is being done; to ensure that actor interests are considered. This will help to give a broader look at how the outputs can serve a wider range of purposes including M and E as well as involve the community in map content and format decisions. This can reduce costs as GIS has the ability to help produce outputs tailored for various uses and users from the same data set. Participation should also be strengthened in the use of GIT spatial analysis functions as it was observed to be weak in the cases studied. Analytical and presentation technologies exist that would help to improve participation in the use of these tools.

►It would be more rewarding in forestry planning to have a good mix of user group based participation and some kind of representative participation to enhance good governance. This would help to strike a balance in actual use considerations in planning as well as the local political and institutional influences.

►CF PGIS planning should take into consideration crucial issues for success such as,

Geographic information management (access, control and use rights): PGIS processes are long and expensive; it might be wiser to develop and maintain CF information systems at community level for strategic, administrative and tactical management tasks. Going through such a process all the time might be difficult and costly. If structural or continuous PGIS is to be successful and maintained to serve CF management and M&E, then GI management most be fully incorporated

Appropriate working scales for community participation: PGIS participation is greatly influenced by the working scale. GIS can produce the appropriate scale for each user from one data set. GIS use provides great opportunities in this direction with its capacity to produce the appropriate scale and content for each user or specific purpose from the same data set.

Training: More attention should be given to community members in those aspects, which they can carry out to reduce costs in the future, as well as guarantee PGIS sustainability. Projects by definition

are short lived and CFs have great potential for income generation to accommodate these efficient GI tools for CF planning and management.

GIS analytical facilities for maximising management options: Current community forestry planning is done basically with little analysis. If communities are to make good use of these resources, then spatial analysis may provide wonderful opportunities for rational decision-making support for communities that can afford. Estimating sustainable yield, monitoring farm expansion and evaluating cost of extraction (optimising) are examples of such opportunities.

►It would be beneficial for MINEF to include into the on-going CF policy (MoP) review the following,

1) Revise the current GI prescriptions to include appropriate working scales and GPS data specifications (map datum). This will help in two ways, **firstly** ensure joint CF monitoring on the ground as stipulated in policy. Current scales of 1:50000 or 1:200000 are not very useful for detailed on the ground work between MINEF staff and the community. Current map requirements also stop at boundary definitions. Revising them will be helpful to all users especially in actual management processes. **Secondly** GPS point data is mentioned in the manual of procedure for CF and some communities do collect it but no specifications are given on the vertical and horizontal datum and so they could come in any form. This would make data transfer difficult. If this were achieved, then the certification of community maps for forest area at the NIC can be eliminated or improved by directly plotting the point data into a GIS at the Community Forestry Unit in the ministry GIS and checking the area and other information. An added advantage of this is a reduction in cost for poor communities involved in community forestry.

2) Encourage and institutionalise land use planning processes and outputs as part of the CF planning process. With sustainable resource management being a major objective CF intends to achieve, a land use planning process gives an opportunity for communities to look at their resources in perspective before allocating community forests (as suggested in the model). That way CFs are less likely to suffer the encroachments that reserves and other forests suffer today.

3) MINEF should train staff to help communities complete the PGIS processes in the short term and to better fulfil their monitoring responsibilities

6.3.2. Recommendations for further research

A number of interesting research issues have been highlighted during this study that need to be investigated. They include:

►Multi-level PGIS planning and decision-making in forestry would be one way of taking this study forward to the higher levels of government. If seen from a forest sustainability perspective then a multi-level PGIS based CPSS can be developed for the country to cover planning, management and monitoring and evaluation.

►Another way forward might be looking at PGIS from a multi-systems perspective. Looking at the PGIS interfaces one finds a real reflection of multi-systems (tasks, institutions, information, policy etc). It might be useful to look further into this for a better understanding.

►Further research in the development of indicators of "good PGIS for good governance" would be helpful in the development of PGIS. Specific aspects to look may include criteria/indicator independence and measurability.

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Appendix

Appendix 1

RELATING GOOD GOVERNANCE DIMENSIONS TO PGIS VARIABLES FOR INDICATOR DERIVATION

Good Governance Conceptual Dimensions	**PGIS Domains / Variables**	**Good governance PGIS process Indicator Issues**
Legitimacy		
●Participation / Representative-ness ●The selection Process ●Recall procedures	●Involvement and representation of al stakeholders ●Institutional Environment ●Access, ownership and control of GI ●Control and decision-making	●Stakeholder satisfaction with decisions made ●Who made what decisions? ●What kind of decisions ●How were decisions-made? ●Stakeholder control of informa-tion
Respect For		
●Basic human rights ●Cultural Group rights (IK)	●Involvement of local knowledge and traditional institutions	●Local knowledge considered in decision-making ●Local institutions incorporated in the PGIS process ●Roles and responsibilities for various stakeholders in the PGIS process
Equity		
●Degree of public access to in-formation and services ●Equality before the law	●Access, ownership and control of GI. ●Influence of and on power rela-tions	●Dominance and absence or mar-ginalisation of stakeholders ●Disadvantaged group involve-ment
Accountability		
●Transparency ●Degree of devolution ●Responsiveness to lower levels ●Accountability mechanisms	●Control and decision-making ●Access, ownership and control of information ●Stakeholder satisfaction with decisions made	**Accountability of community representatives**
Competence		
●Effectiveness ●Efficiency	●Dialogue enhancement ●Power relations	●Output representativeness ●Stakeholder satisfaction with decisions made ●For a for debate in decision making ●How were the decisions made?
	●Norms and traditions ●Education ●Institutional Environment	

The table shows related concepts in good governance and PGIS in the first and second columns. The third column shows the main issues on which PGIS indicators for this study are based. Each row highlights closely related domains and issues. The indicators in table 3.2 are more refined questions relating to CF PGIS based on the third column in this table.

Appendix 2

List of Interviewees and Focus Group Discussions

Transcript No.	Name	Description of position in Community/ Project
	Tinto (Case 1)	
T1	Eyong Abraham Tanyi	Community Forest Management Officer.
T2	Agbor Ashu Roland	Vice Chair of the management committee of the Tinto Community Forest
T3	Antem Peter Oben	Tinto Clan Community Forest Common Initiative Group Chairman.
T4	Taku Mathew Atem	Farmer and hunter
T5	Atem Jackson	Secretary, Tinto management committee
T6	Betek Thomas	Farmer and hunter
T7	Nformbu Morrie	Farmer and Hunter
T8	Atem David	Farmer and hunter
T9	Mrs. Bechem Pauline	Member of Management Committee of the Tinto CF as well as leader of several women's groups
T10	Focus Group Discussion Diagramming Sessions: Kum Joseph Mandi, Ntui Dorothy Ako, Jackson Atem and Ashu Roland Agbor (Not recorded on tape)	Mix of farmers and hunters
	Bimbia-Bonadikombo (Case 2)	
B1	Nemoh Egbe Akpan (Not recorded on tape)	MINEF staff on secondment to MCP in charge of forest surveys and mapping issues
B2	Makaka Ludwig Manga Williams	Community Forest Management Officer
B3	MacDonald Kemmer Elive	Adviser and Chairman of the Operations Committee of the Bimbia Bonadikombo Community Forest.
B4	Tekwe Charles	MINEF staff on secondment to MCP and team leader for all (four) area teams on the project
B5	Amendak Emmanuel	GIS unit staff in charge of field data collection and minor GIS operations involved in the mapping process
B6	Julie Fawoh	Former Mount Cameroon Project Staff in Charge of Institutional Development in the BB CF development process
B7	Honourable Mrs. Gwendolyn Burnley	Chair of the Bimbia Bonadikombo Natural Resource Management Committee
B8	Ntube Grace	Former MCP staff and community member involved in community based mapping in the Mukoko area
B9	Nsoyuni Lawrence (Not recorded on tape)	Current Head of GIS Unit of the Limbe Botanic Gardens (Worked on the BB MCP area CF maps)- An ITC Graduate
B10	F G D and Diagramming session: Njie Thompson, Peter Ndoki, Ejong Alfred, Mbella Njoh, Thompsom Ekema, Mokoko Gustave, Elambe Mbappe, Isaac Njoh, Noble Tanga, Eyoum Breeze, Malafa Gideon and Joseph Wose.	All are Operations Committee Members present from the beginning of the CF process

Appendix 3

SSI Interview Template (For Process evaluation)

►Self Introduction

►Explanation of Study objectives
(I.e. emphasize learning to benefit student and also community/NGO/interviewee)

►Introduction of Interviewee

►Seek consent on recording

►Conversation -Guiding Questions

1) Can you tell me about how you were involved in the mapping process?

2) Many persons were involved, how did you relate to these people during those activities?

3) What did this process produce? Or what were the results of this process? For example maps, papers and reports managed?

4) How was the information coming from the work, for example maps, papers and reports managed?
5) How have these products being used? Can they be more useful?
6) Could everyone in the community access the information?

7) What kind of important discussions went on during those activities that produced the different maps of the community forest? Especially some new discussions that you never had before.

8) What were these discussions for and how useful were these discussions?

9) How did the people, institutions, culture and tradition existing in the community before the mapping influence the mapping process?

10) What did you like in the process?

11) What did you not like about the process?

(Last two questions offer the possibility to probe more on issues in order to close gaps or further develop salient points raised during the interview.)

12) Do you have any question for me?
(This is a vital question in that it helps clarify issues; it might even raise a relevant issue that the interviewer never thought of. It could also serve as a validity test of the data.)

►The interviewer will emphasize on getting proof on change related questions, as these will substantiate the arguments in the analysis.
►A recording of the conditions under which the interview took place as well as the mood of the interviewee shall be done in the few minutes after the interview.

PGISystem participatory diagramming Template

►Introduction of Facilitator (Peter- Student)

►Purpose of the activity (Including potential benefits to community)

►Introduction of participants

►Exercise (Icebreaker) on rules in diagramming (code of conduct)

►Steps

1) List all community based mapping activities
2) List all concrete results/outputs
3) Description of activities (Input –process- output)
4) Formulate/ designate symbols for activities, processes, outputs and relationships.
5) Map or draw relationship between activities in a diagram in method preferred by the participants.
6) Analysis of diagram, (Identification and justification of aspects they enjoyed most and those they enjoyed less or not at all). *To also include a special discussion on the resulting maps.*
7) Making a future system diagram based on the discussions from the preceding step.
8) Transfer diagrams onto paper and distribution.

►The facilitator will also observe the entire process and make notes.

►Note taking shall be done all through the process in conformity with basic field note conventions (Kirk and Miller, 1986; Silverman, 2000).

Appendix 4

Summary of Codes used during the analysis of the transcripts and field notes

Code level 1	Code Level 2	Code level 3
(D) Description	(1) Inputs	
	(2) Process / Activities	
	(3) Outputs	
	(4) Participation / Stakeholder Involvement	
	(5) Factors Influencing	
	(6) Problems	
(O) Outputs	(1) Actor GI need	
	(2) Content of outputs	(a) Conventional (b) ISK
	(3) Output / GI use	Different categories (Craig and Elwood, 1999)
	(4) Perception of Outputs	(a) Positive (b) Negative
(G) Governance	(1) Decision-making	
	(2) Access and ownership of GI	
	(3) Change	
(A) Other Information		

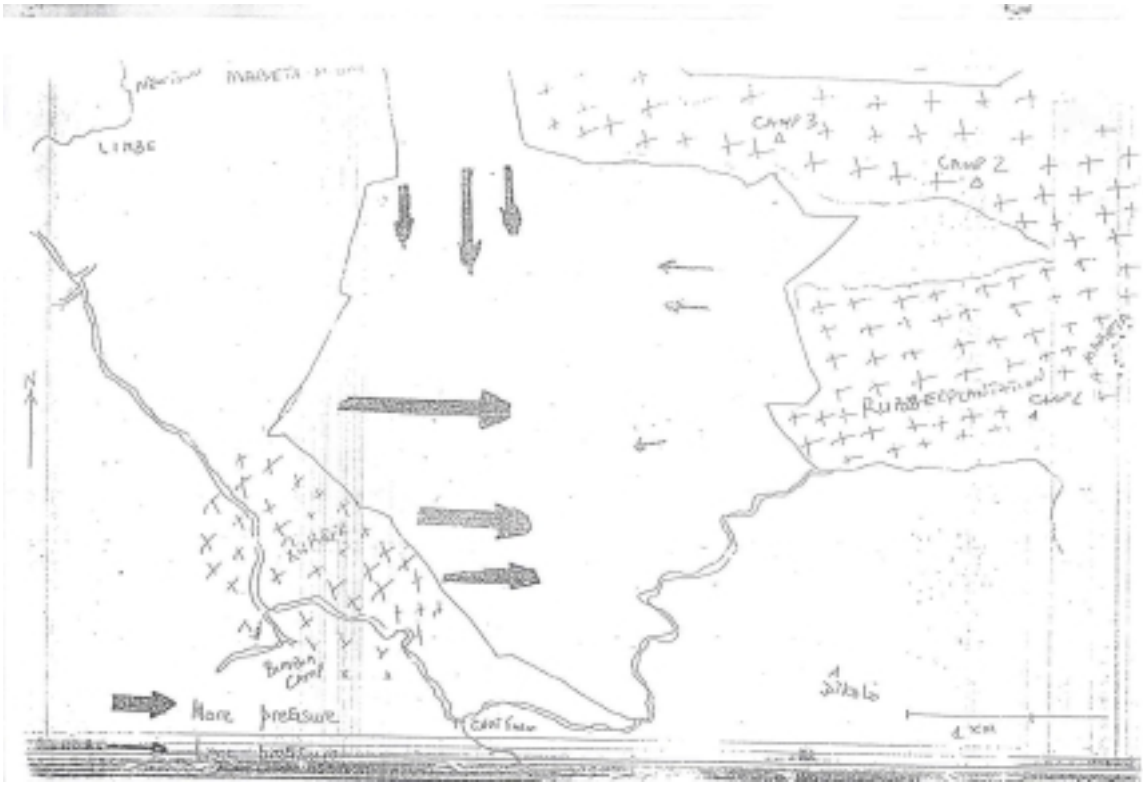
Code:

T2O2a

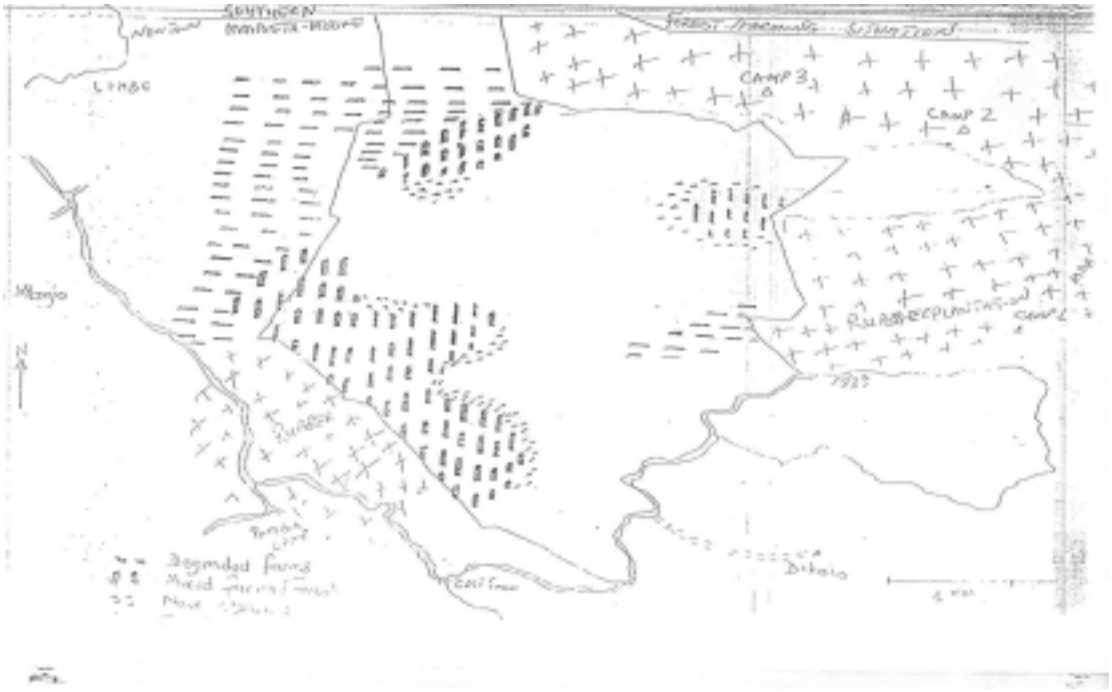
Where,
T = Case Study site;
2 = Interviewee Number;
O = Code level 1;
2 = Code level 2 and
a = Code level 3

Appendix 5a

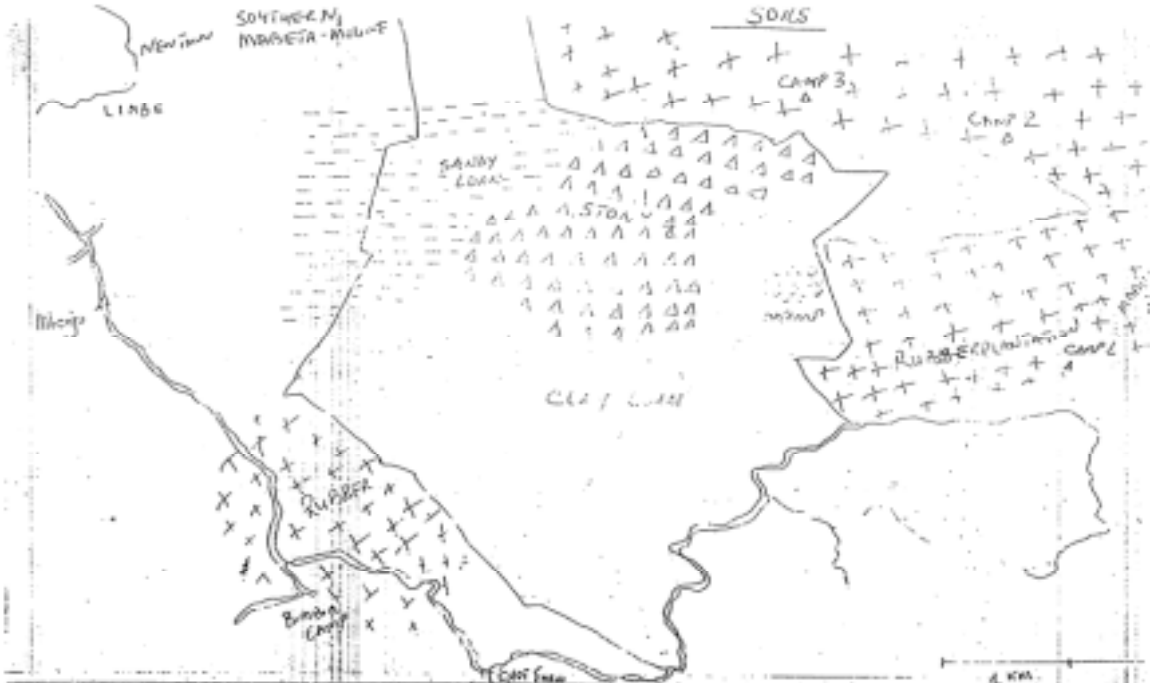
SOME EXAMPLES OF CBM INTERMEDIARY PRODUCTS



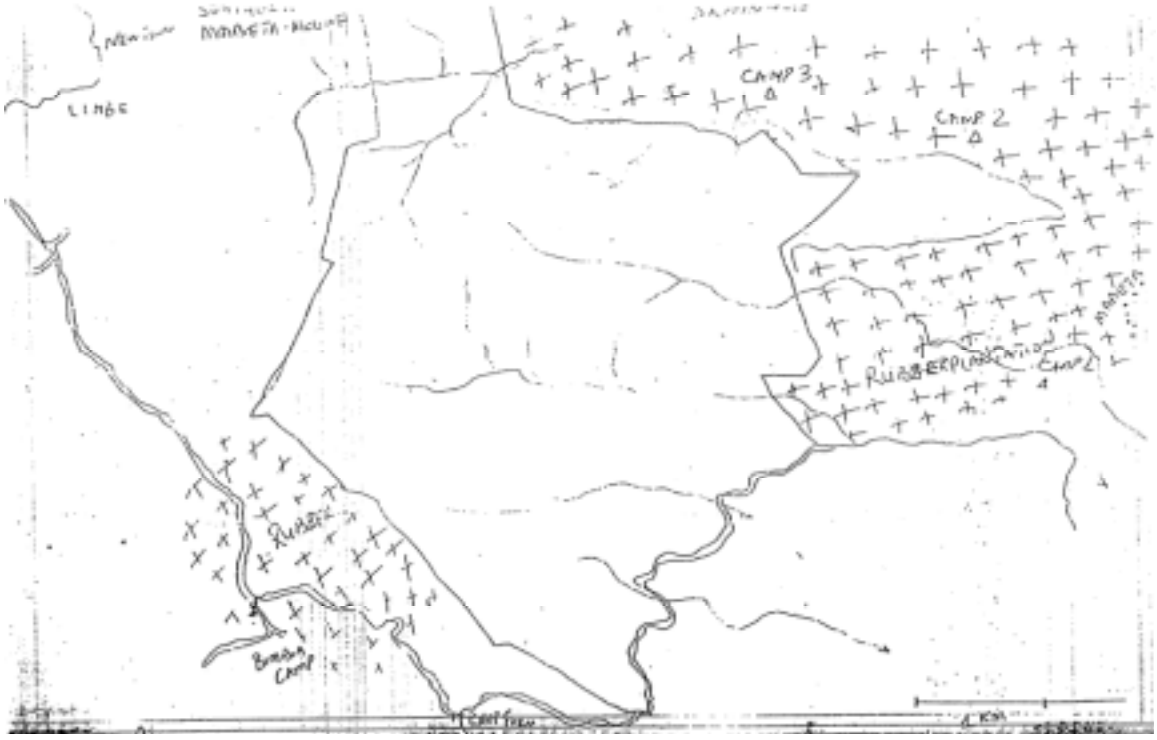
Pressure perception map from the BB land use planning process



Forest degradation map from the BB Land use planning process

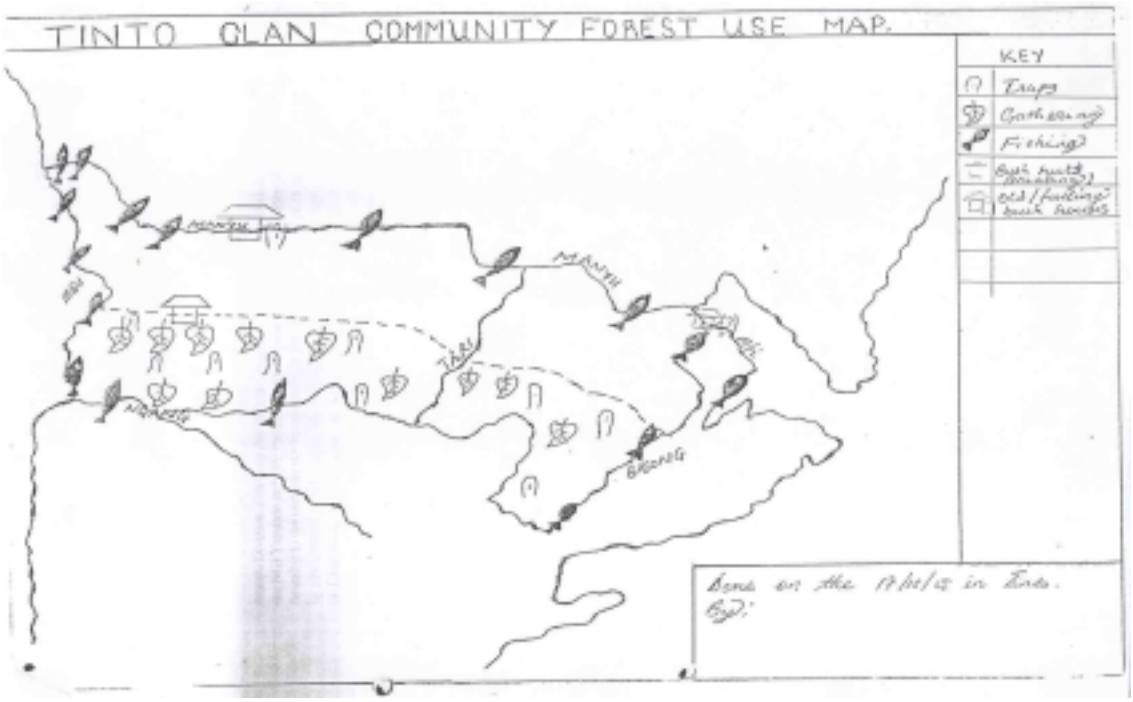


Soils map of the BB area from the land use planning process

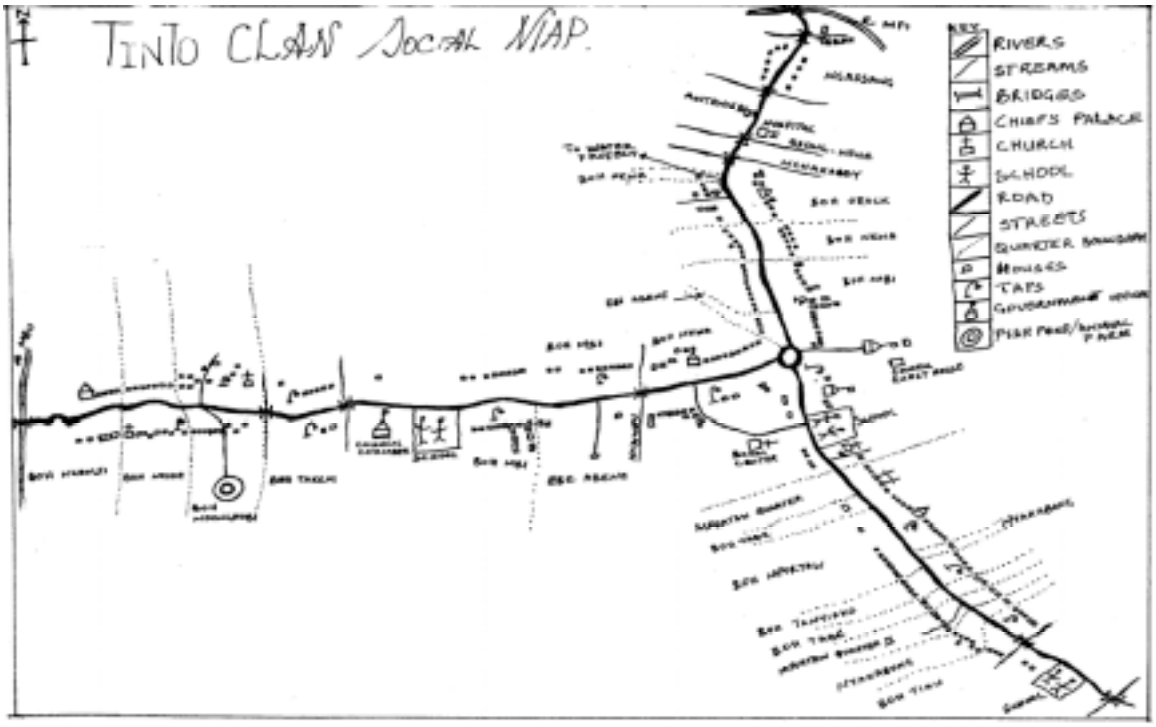


Map of plantation extents in the BB area made during the land use planning process

Appendix 5b

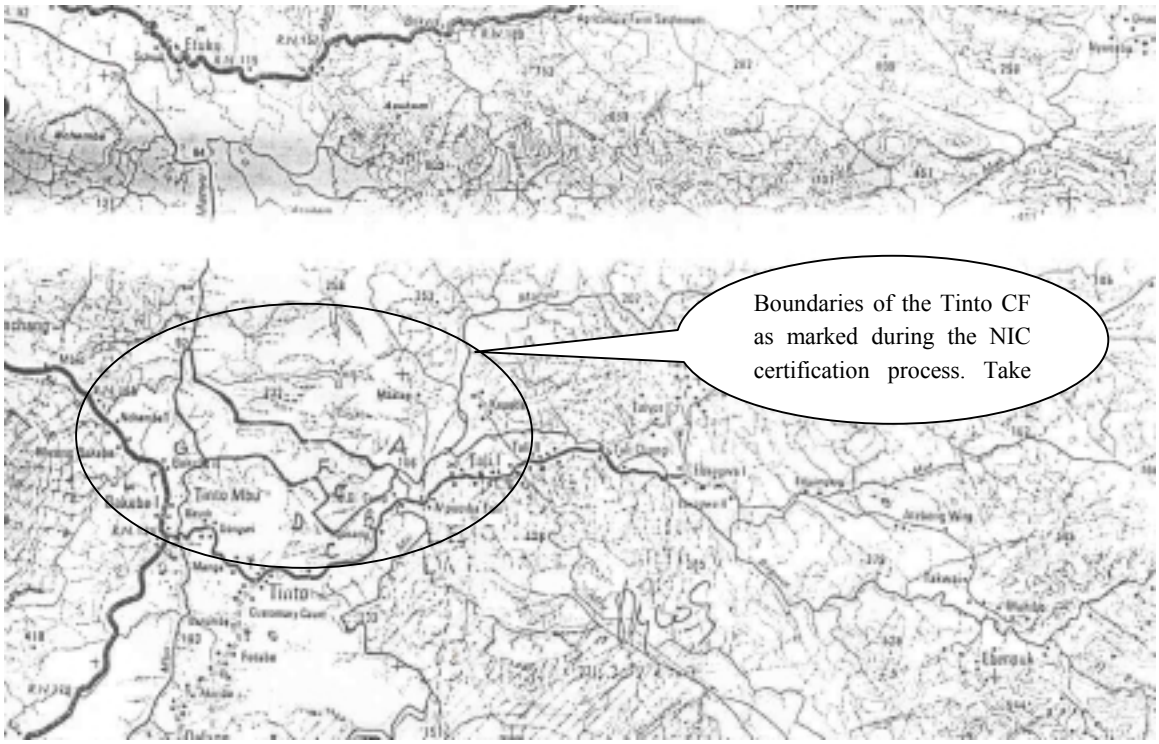


Forest use map from the Tinto PGIS process



Social map of Tinto made for community organisation and benefit sharing planning during PGIS process

Appendix 5c



Sample map from the NIC certification process

REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie

MINISTERE DE LA RECHERCHE SCIENTIFIQUE & TECHNIQUE

INSTITUT NATIONAL DE CARTOGRAPHIE

B.P. : 157 YAOUNDE TEL. : 22 29 21

REPUBLIC OF CAMEROON
Peace - Work - Fatherland

MINISTRY OF SCIENTIFIC AND TECHNICAL RESEARCH

NATIONAL INSTITUTE OF CARTOGRAPHY

BOX : 157 YAOUNDE PHONE : 22 29 21

Yaoundé, le 30 Décembre 2000
the

DEPARTEMENT DE LA CARTOGRAPHIE
ET DE LA TELEDECTION

N° ...../MINREST/INC/DCT/SC

ATTESTATION DE MESURE DE SUPERFICIE

Superficie mesurée	: *1.295 hectares*
Demandeur	: *TINTO CLAN COMMUNITY FOREST B.P.*
Référence	: *Carte de Mamfé à 1/200 000*
Situation Administrative de la Zone Forestière	: *Département(s) de Manyu Division Arrondissement(s) de Upper Bayang Subdivision*
Planimètre utilisé	: *CORADI N° 36891*

DESCRIPTION DE LA ZONE FORESTIERE

Le point de base A de la forêt sollicitée Communautaire sollicitée par le Demandeur se trouve à l'Ouest du village Mpumba Tali, à la confluence des rivières Manyu et Mfi.

Cette forêt est limitée :

A l'Est, par Mfi en amont sur 200m, puis l'affluent droit immédiat en amont jusqu'au confluent situé à 1,5 km. Soit B ce point.

Au Sud, par les droites : BC = 1,3 km ; CD = 1,3 km ; DE = 0,7 km d'azimut respectifs 253 ; 353 ; 53 et 372 grades. Enfin, par l'affluent gauche immédiat de la rivière Mbu en aval d'où le point G.

A l'Ouest et au Nord, par Mbu en aval puis Manyu en amont jusqu'au point A.

La zone forestière ainsi circonscrite couvre une superficie de Mil Deux Cent Quatre Vingt Quinze hectares.

La présente Attestation lui est délivrée pour servir et valoir ce que de droit.

Appendix 6

PARTICIPATION DIMENSIONS

1.0 PARTICIPATION TYPES

(An adaptation from Pretty and Cornwall 1996 by Catley 999).

(I) Manipulative participation (Co-option)
Community participation is simply pretence, with people's representatives on official boards who are unelected and have no power.

II) Passive Participation (Compliance)
Communities participate by being told what has been decided or already happened. Involves unilateral announcements by an administration or project management without listening to people's responses. The information belongs only to external professionals.

III) Participation by Consultation
Communities participate by being consulted or by answering questions. External agents define problems and information gathering processes, and so control analysis. Such a consultative process does not concede any share in decision-making, and professionals are under no obligation to take on board people's views.

IV) Participation for Material Incentives
Communities participate by contributing resources such as labour, in return for material incentives (e.g. food, cash). It is very common to see this called participation, yet people have no stake in prolonging practices when the incentives end.

V) Functional Participation (Cooperation)
Community participation is seen by external agencies as a means to achieve project goals. People participate by forming groups to meet predetermined project objectives; they may be involved in decision-making, but only after external agents have already made major decisions.

VI) Interactive Participation (Co-learning)
People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve projects goals. The process involves interdisciplinary methodologies that seek multiple processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.

VII) Self-Mobilization (Collective Action)
People participate by taking initiatives independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how available resources are used. Self-mobilisation can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilisation may or may not challenge existing distributions of wealth and power.

2.0 PURPOSES OF PARTICIPATION

(By McCall, 1998)

I) Participation as a means of participation

Participation is seen as a means to facilitate and lubricate outside interventions and policies, which are selected by higher-level authorities (state, region, or party)

2) Participation as a means for mediation

Participation seen as a means to modify and guide and re-direct higher level interventions and otherwise centralized power so as to more genuinely reflect local needs, aspirations, and resource constraints.

3) Participation as empowerment

Participation as empowerment of the weakest rural groups- - power in terms of access to, and control over, resources and in terms of social distribution of the resources.

"There is considerable overlap between the three purposes - - facilitation, mediation and empowerment - - and the interpretation of any particular case study can easily shift from one category to another depending on the ideology in fashion. However, there are certain characteristics, which can be used to frame the three as a continuum (as illustrated below)

Facilitation Mediation Empowerment

Less ◆——————————————————————▶More

- ●Explicit recognition of socio-economic groups;
- ●Emphasis on self-reliance;
- ●Emphasis on action, especially collective action;
- ●Emphasis on internal process; and
- ●Requirement for political commitment:

-Emphasis on inputs to decision-making from lower down the power hierarchy (bottom-up; and

-Participation as a process, having its own inherent value

3.0 USES OF MAPS AND GEOGRAPHIC INFORMATION BY COMMUNITY ORGANISATIONS

By Craig and Elwood (1998)

I. Administrative

A. Provide information to support actions of staff members

1. Records of complaints and inspections of violations about problem properties
2. Records of property information for writing mortgages fro loans
3. Maps showing loans/grants given to ensure even distribution

B. *Information programming by neighbourhood group*

1. Maps showing existing block clubs and other programs, areas in need of them
2. Maps showing areas to target in door-knocking efforts, literature drops

II. Strategic

A. General assessment of neighbourhood needs and existing resources

1. Analysis of demographic and income data from census to determine services needed
2. Market analysis fro types of businesses needed
3. Thematic maps of housing values to determine areas in greatest need
4. Wide-wide crime map to determine areas needing crime-fighting action
5. Map of existing social services and business in neighbourhood

B. Search for general location of service or organization

1. Map of church members' and visitors' addresses to relocate church
2. Map showing residential location of Hispanic youth to relocate education program

C. Evaluate the success of existing city an community programs

1. Map type location of neighbourhood programs
2. Evaluate impact of non-profit multi-family housing developments on community

III. Tactical

A. Guide action/assistance to specific parts of neighbourhood

1. Map of registered voters to determine areas to concentrate registration efforts
2. Map of housing rehab loan recipients to guide efforts at contacting non-participants
3. Map of vacant lots to search for space fro community garden
4. Map documenting high number of drug arrests near a particular public phone

B. Contest map of opponents

1. Map of airport noise showing discrepancies with official map
2. Higher resolution analysis showing greater impact of highway reconstruction on low income residents and people of colour
3. Showing residents the misrepresentations in official map of road expansion

IV. Organizing

A. Recruit new members

1. Door knock using maps showing problems the group will address
2. Providing names and phone numbers to prospective block captains

C. Facilitate meetings

1. Maps of alternative intersection redesigns to aid in conflict resolution
2. Neighbours add local knowledge about homes to laminated parcel maps using dry markers

D. *Get attention and assistance from government, granting agencies, other neighbourhoods*

1. Maps and data included in grant applications
2. Maps of existing problems given to media at neighbourhood events
3. Maps demonstrating neighbourhood problems and needs, given to city government