IMPLEMENTING GLOBAL ENVIRONMENTAL POLICY AT LOCAL LEVEL: COMMUNITY CARBON FORESTRY PERSPECTIVES IN CAMEROON

Peter Akong Minang

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International Institute for Geo-information Science and Earth Observation, Enschede, The Netherlands

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DISSERTATION

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on account of the decision of the graduation committee,
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by

Peter Akong Minang

born on September 30, 1970

in Kumba, Cameroon

This thesis is approved by

Prof. dr. Hans Th.A. Bressers, promotor

Dr. Michael K. McCall, assistant promotor

Dr Margaret M. Skutsch, referent

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Acronyms

ANAFOR	Agence Nationale d'Appui au Développement Forestier
AR	Afforestation and Reforestation
BBNRMC	Bimbia Bonadikombo Natural Resource Management Council
C	Carbon
CBD	Convention on Biological Diversity
CDC	Cameroon Development Corporation
CDM EB	Clean Development Mechanism Executive Board
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CETELCAF	Centre de Télédétection et de la Cartographie Forestière
CF	Community Forest
CFA	Communauté Financière Africaine or XAF
CFM	Community Forest Management
CIT	Contextual Interaction Theory
COP (CP)	Conference of Parties
DNA	Designated National Authority
DOE	Designated Operational Entity
GEF	Global Environment Facility
GFW	Global Forest Watch
GIS	Geographic Information Systems
ICRAF	World Agroforestry Centre
ILUF	Integrated Land Use Framework
INC	Institut National de Cartographie
IPCC	Intergovernmental Panel on Climate Change
IRAD	Institut de Recherche pour L'Agriculture et le Développement
LULUCF	Land Use Land Use Change and Forestry
MCBCC	Mount Cameroon Biodiversity and Conservation Centre
MDP	Mécanisme pour le Développement Propre
MEA	Multilateral Environmental Agreements
MINEP	Ministry of Environment and Nature Protection
MINFOF	Ministry of Forests and Fauna
MINRESI	Ministry of Scientific Research
NGO	Non Governmental Organisation
NTFP	Non Timber Forest Products
PDD	Project Design Document
PES	Payments for Environmental Services
PGIS	Participatory Geographic Information Systems
PIN	Project Inception Note
PRA	Participatory Rural Appraisal
REDD	Reduced Emissions through Deforestation and Degradation
SIGIF	Système de Gestion des Informations Forestière
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCCF-CIG	Tinto Clan Community Forest Common Initiative Group
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

Chapter 1

Introduction

1.1 Introduction

This study addresses the challenges and opportunities for implementing global environmental policy at the local level. It seeks to understand the dynamics of global, national, sub-national and landscape (project) level realities that will enable or inhibit the realization of multi-lateral environmental agreements. The Clean Development Mechanism of the Kyoto Protocol is examined as an example of global environmental policy, while community carbon forestry in Cameroon is used as a developing country context. The study presents a cross-scale analysis from multiple dimensions including: forest policy (macro level); information management (macro-meso-micro levels); community capacity, local knowledge, and governance (at micro level). These dimensions constitute the various angles or lenses through which I examine the issues in the each of the ensuing chapters. Permit me to begin by introducing the underlying concepts, research problem, questions, context and methods of this study in this opening chapter.

1.2 Environmental Services from Forest Land Uses

Forests can provide environmental services including carbon sequestration, water protection, biodiversity protection and scenic beauty for which payments or compensation can be received. Payments for Environmental Services (PES) constitute part of an emerging paradigm in land use management in which land and natural resource users provide environmental services for some form of payment within specified/agreed conditions. Proponents of the PES paradigm argue that compensating land users for environmental services would give market reason for actors to consider such services in decision-making processes, thereby increasing chances of curbing deforestation and other environmental problems such as soil erosion, floods etc (Pagiola et al, 2005). The failure of current models such as Integrated Conservation and Development Projects and Sustainable Forest Management to provide sufficient incentives and motivation to stimulate conservation, reforestation and / or increase incomes of local populations has been used as supportive evidence (Zbinden and Lee, 2005). Another reason for payments relates to environmental justice in which industrialised / polluting countries compensate non-polluting countries for the effects of their pollution.

The shift in paradigm means an extension from more tangible and traditional land /forest product benefits of wood (e.g. fire wood, timber) and non-wood (e.g. nuts, fodder, oils, medicine, etc) to marketing environmental service benefits (e.g. watershed protection, biodiversity conservation, carbon sequestration and scenic beauty). The introduction of services brings about changes in the objectives, kinds of actors, institutions, rules and interactions within land use management production systems.

For example, automobile producing multi-nationals may contract carbon sequestration or emission reduction services from a group of forest owners and users in a tropical country to fulfil emission reduction targets or enhance their corporate image. A new set of willing service providers offering services to buyers will emerge as key actors of PES, often ushering in a new dynamic in which certification is required from an independent body.

Wunder (2005) distinguishes three groups of PES types. A group characterised by the vehicle used to achieve the service. This could be area-based (i.e. land units contracted for scenic beauty or carbon management) or product-based (i.e. consumers pay a "green premium" for a certified product). The second group is distinguished by the nature of the buyer. For instance, Public schemes in which the state buys the environmental services or Private schemes in which private buyers negotiate directly with service providers. A third category can be identified by the resource or land use. This could involve use-restricting schemes wherein use caps are put to allow regeneration or asset-building schemes such as afforestation to restore a service.

Wunder's characterisation shows that PES systems are varied and can operate at different scales. Spatial units are relevant for determining the scale of watershed protection and scenic or landscape beauty service systems. Policy or political economy may well be relevant in determining the scale of carbon and biodiversity service systems. A combination of variables may better explain whether or not a service system extends beyond the landscape level through to a global market or service system. This study will focus on forest carbon sequestration services within the Clean Development Mechanism of the Kyoto Protocol.

1.3 Forests, Carbon and PES

Forests have a tremendous capacity to cause as well as avoid and remove carbon emissions. Tropical deforestation alone accounts for 20% of greenhouse gas emissions (Chomitz, 2002a). On the other hand, forests have the capacity to act as sinks (the ability to absorb and hold carbon dioxide for long periods). The IPCC Third Assessment Report (IPCC, 2000) puts the total potential for avoiding or removing carbon emissions through aggressive forestry practice changes on 700 million ha of forest at about 60-80 billion tons or about 12-25% of the "business as usual" fossil fuel emissions over a period of 50 years.

As a corollary, forests have been at the heart of strategies to mitigate increasing greenhouse gases in which carbon dioxide is the dominant component, occupying about 0.03% of atmospheric volume and increasing in concentration by 25% since pre-industrial times (IPCC, 2000). Bass et al. (2000) cite three forest related approaches that have been used in varied combinations within the strategy to reduce greenhouse gases from the atmosphere. These are,

- Halting or slowing down deforestation by preserving the current carbon reservoirs (Carbon conservation)
- Increasing vegetation cover through afforestation so that it can hold carbon for longer time (Carbon sequestration)
- Converting vegetation into timber products which store carbon or substitute bio-energy for fossil fuel so that less carbon is emitted into the atmosphere (Carbon substitution)

Ecosystem Marketplace (2006) estimates that about 745,000ha of land have been brought under carbon sequestration activities, yielding carbon offsets worth $84 million in the last ten years. Forest / land use based carbon sequestration projects accounted for about 4% of global carbon market worth ($11.75 billion) in 2005 (Lecoq and Capoor, 2005). An overview of some carbon sequestration projects can be found in Tipper et al. (2002), Kagi and Schoene (2005), Auckland et al (2002) and Jindal et al. (2006).

Some carbon forestry projects come under global payments for environmental services such as the Joint Implementation (JI) and the Clean Development Mechanism (CDM) schemes within the Kyoto Protocol of the UNFCCC. Projects under these global schemes fall under the so-called "compliant" markets while all others fall under the "voluntary" market. Africa currently has 19 carbon sequestration projects in 16 countries on the continent, all of which fall under the voluntary market (Jindal et al. 2006). One reason for these projects not to be under the CDM is that, CDM conditions are too difficult. Only one out of about 30 CDM forestry projects has been approved to date. Kagi and Schoene (2005) provide an overview of the methodological problems with CDM forestry proposals. This study focuses on carbon forestry development within the Clean Development Mechanism as an example of a global PES policy.

1.4 The Clean Development Mechanism (CDM)

The CDM is one of three "flexible mechanisms" of the Kyoto Protocol designed to accomplish the objectives of the UNFCCC. It makes provision for investment by industrialised countries and industry in projects related to carbon emission reduction and carbon sequestration in developing countries. These projects should contribute to sustainable development in developing countries (i.e. Non-Annex 1 countries) while enabling developed countries (i.e. Annex 1 countries) to meet Kyoto emission reduction and quantified emission limitation targets (Art. 12.2 of the Kyoto Protocol).

CDM projects are expected to meet a set of requirements prior to the issuance of certified emission reductions by the CDM Executive board. These requirements are articulated in the Kyoto Protocol and in subsequent decisions taken during the Conference and Meetings of Parties (mainly in Decisions 19/CP.9 and 14/CP.10 and the Marrakech Accords). These requirements can be summarised under the following categories: eligibility, additionality, acceptability, externalities and certification.

Eligibility specifies that only afforestation and reforestation activities qualify under current rules. Afforestation would mean planting trees on land that has not been forest for a period of at least 50 years (i.e. according to the host country definition of forest). Reforestation would mean planting trees on land that was not forest on 31 December 1989. Additionality means carbon mitigation effects "with project" must be additional to what would have happened "without project". Acceptability stipulates that all projects must contribute to sustainable development based on country criteria, while externalities require all projects to carry out an impact assessment study and present impact mitigation strategies if need be. Certification means that projects must be independently verified and certified. See chapter 2.2.1 and 3.3 for details on CDM criteria and procedures.

Only one CDM forestry project has been approved to date. However, current distribution of projects (energy and forestry) in the Kyoto based mechanisms is highly uneven. Asia is leading with about 73%, followed by Latin America with about 17% and Africa is trailing with less than 3% (Capoor and Ambrosi, 2006a; CD4CDM, 2006). Africa hosted less than 14% of projects during the experimental phase of the CDM known as Activities Implemented Jointly- AIJ phase (1995 –2001). With projections indicating the size of the CDM market could be 217 – 640 million tCO2 per year by 2010 (Haites, 2004), there is great concern that Africa may lose out on opportunities. Broad estimates by Jindal et al. (2006) indicate that 13 of the 19 projects in Africa may produce only 32.23 million tCO2 under different timelines. This inertia is also evident with the development of water protection and ecotourism services compared to Latin America and Asia (Pagiola et al., 2005)

I have chosen the CDM as the focus of this study because it offers a ready framework for Africa to join in the short term.

1.5 The Research Problem

Inertia in CDM forestry project development in Africa is the central problem being addressed in this research. A number of reasons have been advanced for this inertia.

To begin with, the CDM was conceived through a lengthy multi-lateral negotiation process for implementation at the local level in developing countries. Most often developing countries have had one representative each, while developed countries sometimes have tens or more negotiators (Najam et al, 2003; Mwandosya, 2000). As a result, little attention was paid to the interests and local realities in the host country contexts within which this policy is being implemented.

Hence, the IPCC report (2000) noted that current CDM modalities and information requirements are beyond the scope of poor communities. Desanker (2005) also cites poor institutional capacity, policy support and knowledge and skills as factors that explain Africa's inertia in carbon project development.

However, little research has been done to empirically explain the "implementability" of an internationally negotiated environmental policy such as the CDM in Africa or indeed other parts of the world (Michealowa, 2003; Masripatin, 2005). This study attempts to make a contribution in this respect by analysing CDM modalities vis-à-vis local realities in Cameroon.

This thesis argues that International environmental policy such as the CDM would have to go through a filter of national and possibly regional level policy mediation to get to the operational level where projects are implemented. Successful implementation is thus dependent on the realities at national, sub-national and project level. Coming from the outside, a first challenge for global environmental policy implementation would be the degree to which related national policy could contradict or compromise and facilitate or inhibit local understanding and its application (Harmon, 2001; IPCC, 2000; Kennett, 2002). In this instance national policy includes aspects of forest and land use policy.

Given the stringent and cumbersome information requirements of the CDM, a second challenge for its implementation could be the degree to which data and information infrastructure at national, sub-national and project level can accommodate and facilitate its implementation (IPCC 2000; IPCC, 2003).

Since actual project implementation of CDM happens at project level, the capabilities of communities to handle the procedural prescriptions of the CDM is also crucial for determining success, failure or non-implementation of the policy (Asquith et al, 2002; Bass et al., 2000; Smith and Scherr, 2002). This refers to specific capacity issues including knowledge, skills, resources and resource governance.

CDM requirements and the above dimensions suggest that some degree of synergy in multilateral, macro, meso and micro policy is required for successful implementation. But, the degree to which these multi-scale objectives and policies dovetail in carbon projects has received little attention from research (Harmon, 2001; Kennett, 2002).

This study addresses the complex problem of multi-scale policy synergy under five specific but interconnected dimensions namely: national policy, information management, community capacity, local knowledge and local forest governance.

1.6 The conceptual framework

Figure 1.1 presents the conceptual framework of the study. This framework consists of two sections; the carbon policy system and the research process.

The carbon policy system set-up to achieve climate change mitigation through forestry can be disaggregated into five major systems namely,

a. The Global Climate Change Mitigation policy system
b. National Forest and Environment Systems
c. Community (Project) Forest Management System
d. Markets (corporate bodies and funds)
e. Designated Operational Entities (certification bodies)

The community system can be further disaggregated into two sub-systems namely, the Carbon Project Planning Management and the Community Environment. The former is driven and shaped mainly by the CDM requirements and to some extent the national level community forestry provisions. The often top-down perspectives of policy development at International level (e.g. CDM) and National level for the most part ignore ground realities defined by the community environment sub-system at project scale.

As a result, the CDM requirements are complex and therefore well beyond the skills and capabilities of local communities in the developing world (IPCC, 2000). Compatibility issues between CDM requirements, national forest policy, sustainable local livelihood and indigenous knowledge make understanding and the response to these requirements in carbon project development at local level complex.

This study analyses the compatibility between the International CDM rules and three local reality aspects namely, national community forest policy; forest information infrastructure; and community capacity. It then proceeds to develop Participatory GIS based collaborative planning methods that will enhance project development as one route to improving CDM forestry project uptake in Cameroon (right hand side of figure 1.1).

This section shows the conceptualisation of the research process in four steps.

1. A multi-scale analysis of the compatibility between CDM rules and national forest policy. (Policy Analysis)

2. A multi-scale information compatibility analysis to determine information / data needs for carbon planning *(Information analysis)*

3. Development and use of a participatory institutional assessment framework for meeting carbon planning needs within the Kyoto protocol framework *(Institutional analysis, management capacity and information supply)*

4. The development of Participatory-GIS methods for meeting carbon planning spatial information needs.

One key aspect of the study is to develop methods that will accommodate or integrate community systems, knowledge and interests into the Kyoto framework.

1.6.1 Policy Implementation: the point of departure

This study seeks to understand the implementation of global environmental policy at the local level and therefore takes policy implementation theory as the basic starting point. By policy is meant, the methods, laws, administration and decisions related to forest, land use and environmental services for climate change within the CDM and the Kyoto Protocol.

Contextual Interaction Theory-CIT (Bressers and O'Toole, 2005; Bressers 2004), has been chosen as the policy analysis tool for this study, because it encompasses both the substantive and actor-interaction dimensions to policy analysis when compared to other tools such as Policy Network Analysis, Discourse Analysis or Historical Institutionalism (van den Brink and Meijerink, 2006)

Contextual Interaction Theory (CIT) explains the process of implementation of policy instruments and attempts to predict whether in a given case there will be any implementation at all, and under what conditions adequate implementation will occur. It can also be used to determine the degree of adequacy of the implementation of policy with respect to "targets". It is based on the assumption that the course and outcomes of policy implementation depend not only on the characteristics of the policy instruments (inputs) but more importantly on the characteristics of the actors and interactions involved, especially the *motivation* (perception and interpretation of instrument, values, preferences and incentives), *power* (the relative ability of actors to influence policy as determined by bargaining strength and resources) and *information* (availability, access and control) (Bressers 2004; Bressers and O'Toole, 2005). The interaction of these three variables of motivation, power and information results in a prediction of the policy implementation process. (See chapter 2.4.1 for more on CIT).

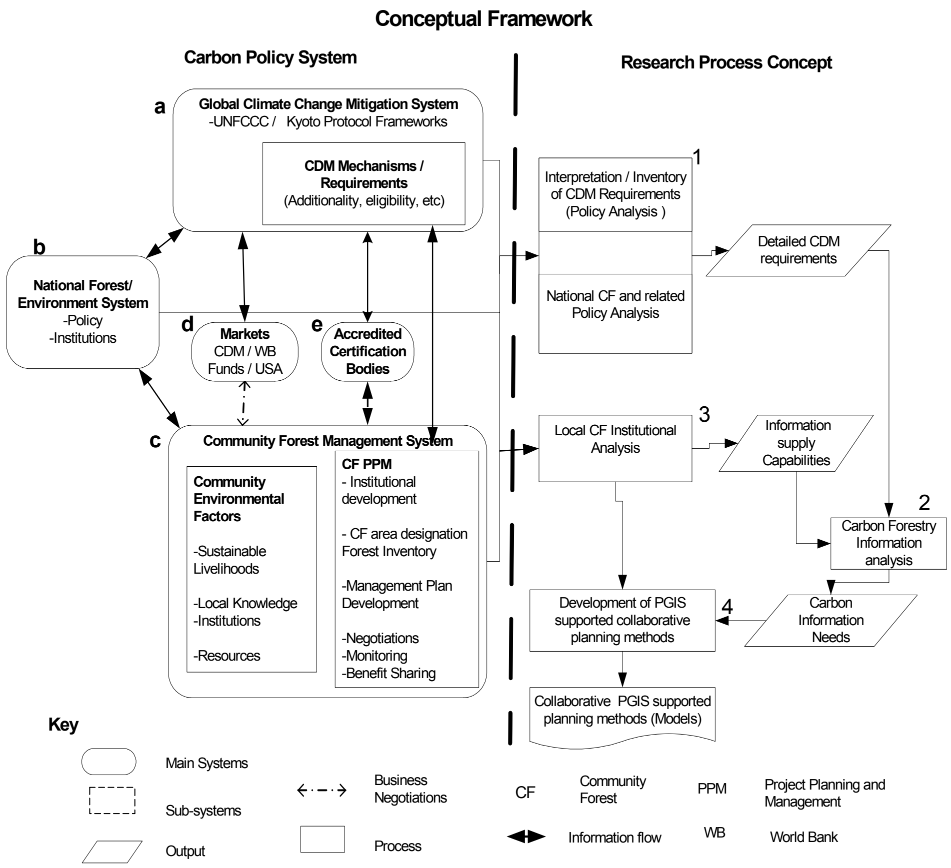

Figure 1.1 Conceptual Framework

We directly apply CIT in the analysis in chapter 1, where policy instruments in Cameroon are analysed. In the remaining chapters we focus on the power and information components of CIT, but we apply multiple and more specialised analytical tools and methods from information science and institutional analysis. In summary, it is the CIT ontology / taxonomy that has guided the structuring of this study.

1.6.2 Participatory-GIS: a carbon forestry enhancement approach

After completing policy analysis at national, regional and project level in chapters 2, 3 and 4, in chapters 5 and 6, PGIS is employed as one route to mitigating the hurdles to project development that emerge from policy analysis.

Participatory Geographic Information Systems (PGIS) refers to a variety of approaches aimed at making GIS and other spatial decision-making tools more accessible and available to those with stakes in decisions (Schroeder 1997 in Obermeyer 1998). Jordan (1999) refers to PGIS as "the use of GIS in a participatory context". 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". PGIS developed as a response to criticisms from social scientists that criticised GIS as being top-down, complex and inaccessible as a tool designed to facilitate decision-making (Rambaldi et al. 2006a).

Applications of PGIS have been growing. The range of methods and techniques has evolved from sketch mapping through GIS mapping, three-dimensional modelling, photo-mapping and mobile-GIS to multi-media applications for visualisation. PGIS applications in forest management have also been growing – see examples in (Lescuyer et al., 2001; Jordan 2002; Kwaku-Kyem, 2002; Mbile et al., 2003; McCall and Minang, 2005). See chapters 5.2.3 and 6.4.3 for details on PGIS.

PGIS is one approach that prides itself in local efficiency and effectiveness in terms of simultaneously meeting content needs, answering questions asked of geo-information and satisfying local stakeholder interests. As such, there is an often-made assumption that PGIS is a tool for better resource governance (McCall, 2003). Hence, I have chosen to explore its potential as an enhancement approach to CDM forestry uptake and development. This reasoning is justified by the information (evidence) provision bias of the CDM modalities.

1.7 Research Questions

The primary research question to be answered by the study is:

To what extent can local realities limit the scope for developing countries to participate in the CDM?

Secondary research questions include:

1. How compatible is Cameroon's national forest policy with the CDM forestry modalities? (Step 1 of figure 1.1)

    a. What are the CDM requirements of national policy?
    b. What are the main CDM-relevant features of current community forest policy in Cameroon?
    c. How do these features of national forest policy support or inhibit CDM forestry implementation in Cameroon?

2. In what ways can the current forest data/information management infrastructure in Cameroon support carbon forestry project uptake and implementation? (Step 2 of figure 1.1)

    a. What are the carbon forestry implementation information demands / needs at the national, sub-national and project level?
    b. What is the nature of Cameroon's forestry data infrastructure?
    c. To what extent does the current data infrastructure support the carbon forestry information demands?
    d. What strategies are required to enhance the CDM information supply capacity?

3. To what extent can current community planning and management capacity meet the carbon forestry project requirements of the CDM? (Step 3 of figure 1.1)

    a. What are the community capacity conditions for CDM forestry project implementation?
    b. What are the community capacity characteristics within community forestry in Cameroon?
    c. How adequately can communities meet the capacity requirements for the CDM?

4. How effectively can local spatial knowledge represent land eligibility evidence for CDM forestry project validation? (Step 4 of figure 1.1)

    a. What are the CDM land eligibility evidence criteria?
    b. What are the potentials of local spatial knowledge in providing CDM land eligibility evidence?
    c. To what extent can maps generated by combining PRA and GIS compare to satellite images of land use in the benchmark years for eligibility in CDM forestry?
    d. What additional value is obtained from using a PGIS approach?

5. In what ways can Participatory-GIS contribute to community carbon forestry good governance in Cameroon? (Step 4 of figure 1.1)

    a. What are the components of governance in community carbon forestry?
    b. What is the potential of PGIS in promoting good governance in community-based natural resource management?
    c. In what ways did PGIS improve good governance for potential community carbon forestry cases in Cameroon?

Each research question and its corresponding sub-questions are addressed in a chapter in the same order as presented above. These chapters are briefly presented at the end of this chapter (in chapter 1.9). The first three constitute the multi-scale analysis while the last two develop PGIS-based enhancement approaches to some of the issues that emerge from the preceding policy analysis.

1.8 Methods and Context

1.8.1 Methods

This study employs a battery of methods within a participatory action research approach. A summary of the methods is presented as part of figure 1.2. The choice of a plethora of methods can be explained by the "unstructured" or "soft" nature of the problem to be addressed. An unstructured or soft problem could be one that has one or more of the following characteristics; revolves around human understanding or interpretations of environment /policy; a situation with obscure goals and or conflicting goals; and susceptibility to or involvement of multiple variables that could be influenced by time or history (Barry and Fourie, 2002; Checkland and Scholes, 1993). All three can be seen in the problem this study seeks to contribute to solving. The interdisciplinary nature of the CDM rules and the required relationship to national and local policy and the CFM context qualify the problem being investigated in this study as soft or unstructured.

Four sets of data collection and analysis methods are distinguished in this study; (i) policy science methods; (ii) information science methods; (iii) institutional analysis (iv) and spatial information sciences. These methods are applied in each of the chapters. Suffice to note that this distinction is only to enable a better understanding, as there was some degree of iteration in the field, hence less crisp boundaries between these sets of methods.

1.8.2 Policy Context: Community forestry in Cameroon

Community forestry was born through a long process of forest reforms that started in 1988 with the development of the Cameroon Tropical Forestry Action Plan. The process resulted in the promulgation of a new forestry Law No. 94-1 of 20 January 1994 in which a community forest is defined as follows:

"that part of non-permanent forest estate (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" (MINEF, 1998).

Community forestry emerged as a key feature in the forestry policy landscape as an attempt to strengthen the participation of local people in forest management and conservation so that forestry can contribute to raising their living standards (Government of Cameroon, 1993; 1995). (See chapter 2.3 for more community forest information).

Community forestry was chosen for this study because the policy provisions for community forestry provide an institutional and regulatory framework for project appraisal, approval and verification by the Sub-Directorate of Community Forestry in the Ministry of Forests and Fauna. Rules and regulations are elaborated in the Manual of Procedures and Norms for the Management of Community Forests (MINEF, 1998). No other forest management unit in Cameroon has such a regulatory framework.

The framework also leaves open the possibility for private investments to be made in community forests as long as they are agreed between the community forest legal entity and the private investor. These characteristics identify community forests with the CDM framework.

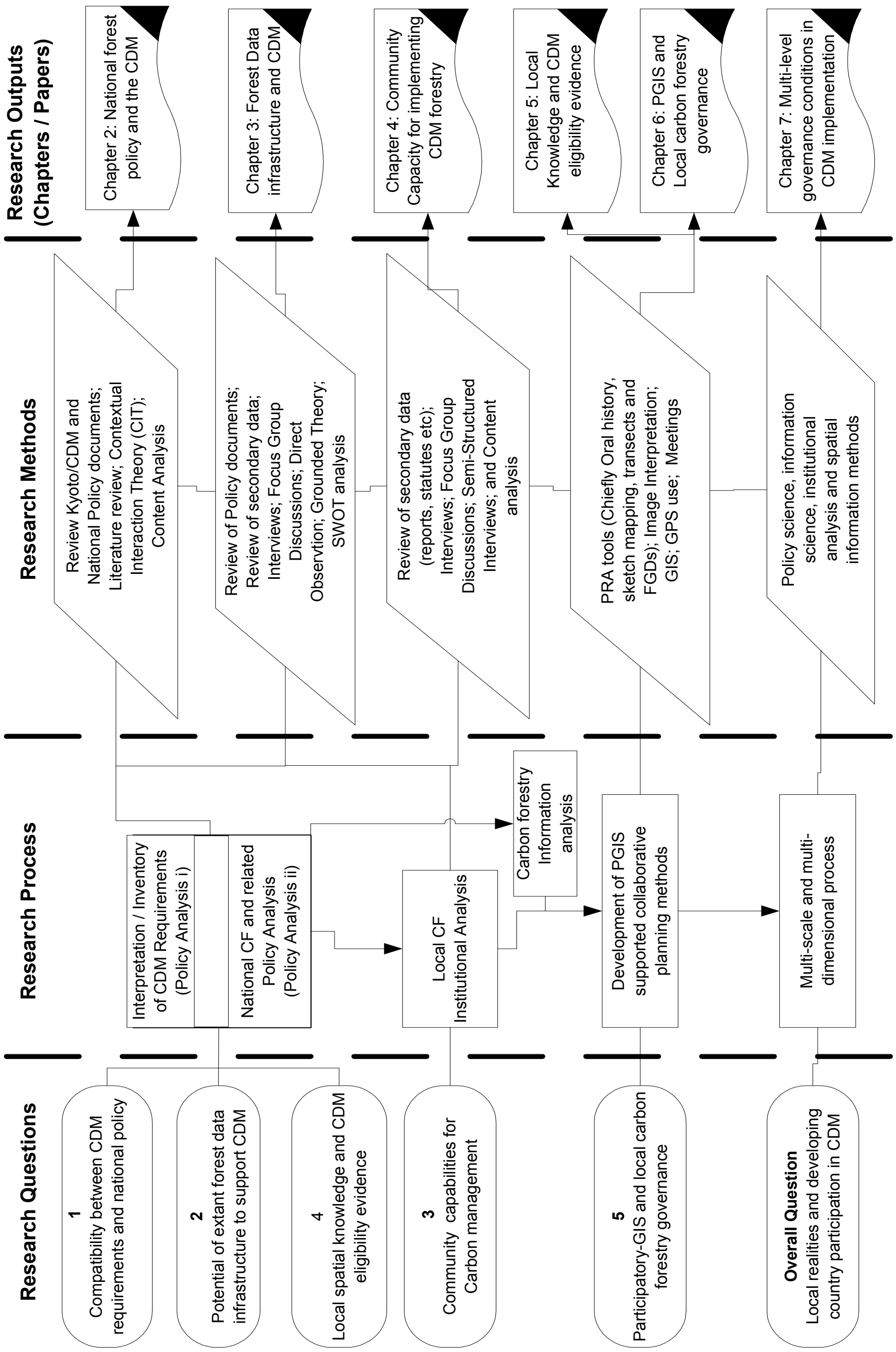

Figure 1.2 Enhanced Conceptual Framework

Secondly, many authors have argued that community forest management has the potential of fulfilling the triple objectives of biodiversity conservation, supporting local development and providing forest services such as carbon sequestration (Klooster and Masera, 2000; Smith and Scherr, 2003). Hence, if well managed it could contribute substantially to the achievement of CDM objectives.

Thirdly, there is a growing potential as more forests in Cameroon are coming under community management following the 1994 forest legislation. By January 2006, there were 334 applications from communities to the Ministry of Forests and Fauna (MINFOF). Of the 334 applications, 90 community forests were under full community management, meaning the figure more than quadrupled from 17 in December 2001. Total area under community forestry could attain 1 million hectares in five years (i.e. 200 community forests at a maximum of 5000ha). However, a good number of the community forests are being hijacked by financially lucrative deals from timber exploiters –about 44% of all community forests as of December 2003 (MINEF, 2003 pg 69 - 73). This runs contrary to the sustainable management objectives that justified the introduction of community forestry. Carbon forestry might provide a lucrative alternative or at least some competition with timber exploitation in this sector.

A disadvantage of choosing community forestry is that a large part of community forests in Cameroon practice forest management, which is not currently eligible for CDM. Relatively fewer community forests practice afforestation or reforestation, currently eligible for the CDM. However, the prospects of, and pressure for, forest management entering into the post-2012 Kyoto Protocol framework and into the non-compliant or voluntary carbon market are good (Santili et al., 2005; Skutsch et al., 2006), thereby justifying a study of the possibilities of proactive forest policy that could apply to all forests in the country.

1.8.3 Study area

Cameroon is found in Central Africa and located between latitudes 1° 60 and 13° 15 N and longitudes 8° 30 and 16° 15 E. 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, and 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, 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 1.3). These communities are presented briefly in the ensuing paragraphs.

1.8.3.1 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 1600 and 1800 (Minang, 2003).

It is a very homogenous community with few inhabitants (less than 1%) coming from other parts of the country and is typically rural in character. However with the status of a sub-divisional 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 and subsistence crops such as cassava and maize. 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, which oversees local resource management policy. This covers farming rights given mainly in terms of the ability to clear forest, after paying some symbolic gifts to the council. The council also administers sacred groves and has introduced and enforced local rules to reduce the use of poisons and explosives in fishing.

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 to regulate forest management activities. Community forestry was introduced only in November 1999 through Living Earth Foundation (an NGO). Taking advantage of the forestry law provisions the community accepted to initiate the community forestry planning process. The community worked with the forest department staff and Living Earth through this planning process between December 1999 and November 2002. The management agreement for a 1300 ha community forest was signed in December 2002 with government.

1.8.3.2 The Bimbia Bonadikombo Community

Location and biophysical environment: The Bimbia Bonadikombo community is located along the coastline of the South West Province on the fringes of the coastal zone and the slopes of Mount Cameroon. 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 different types, littoral vegetation, 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 endemic 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 a complex of many villages namely, Mbonjo, Chopfarm, Banangombe, Bonabile, Dikolo, Mabeta, Ombe Native (Bamukong), Bonadikombo and several plantation worker camps (see figure 1.3). All but two of these settlements are typical rural settings. Bonadikombo and Bonabile are peri-urban and located on the fringes of the Limbe (Victoria) urban community. Limbe and the surrounding areas have 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.

The occupational distribution of occupations residents in this community is diverse. 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 many who are involved in forest extraction activities which in order of importance, are timber exploitation, charcoal burning, fuel wood collection for income, hunting and NTFP collection (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 in 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.

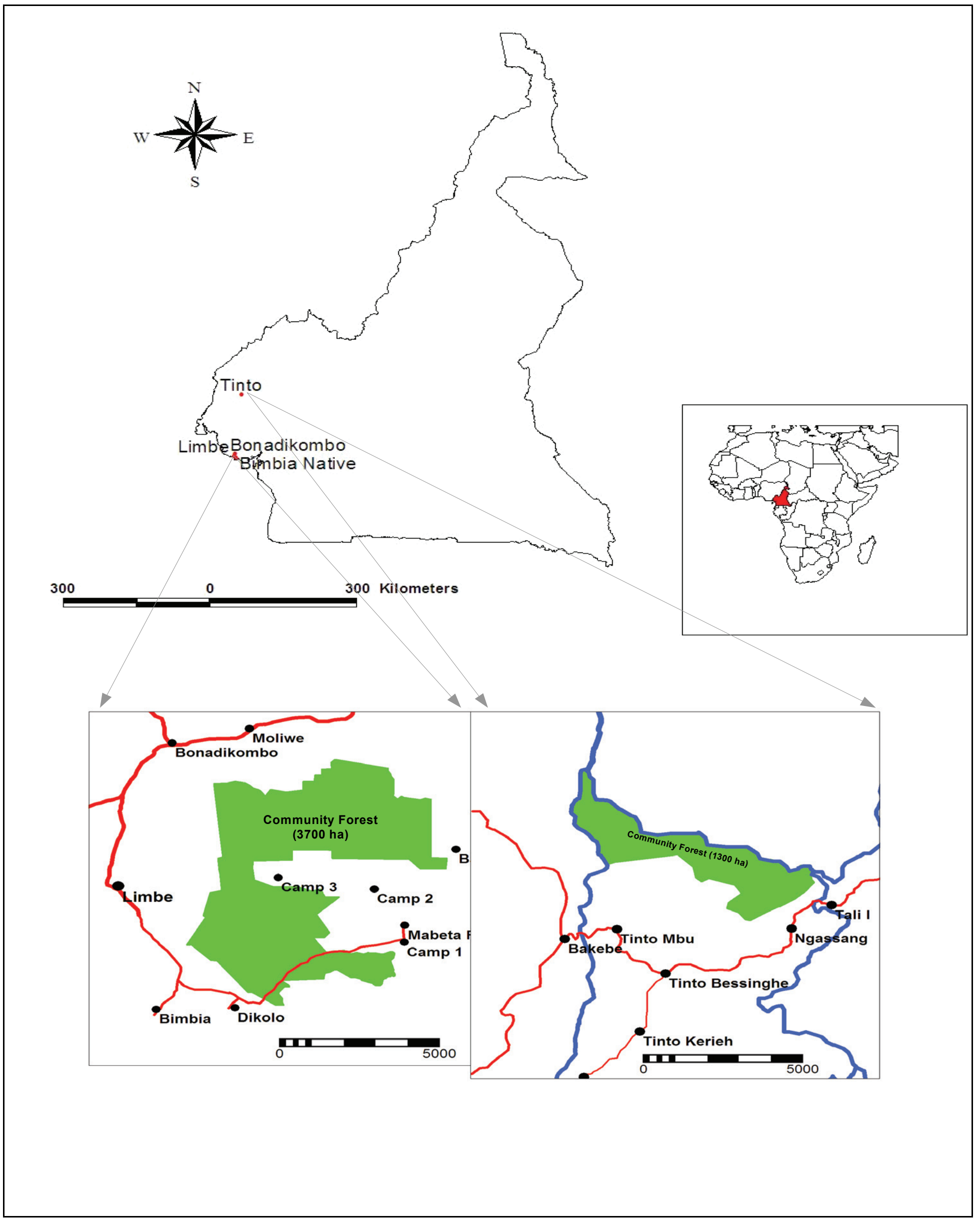

Figure 1.3 Map showing study area

In this peri urban and heterogeneous setting, control of forest management by the native authorities has been difficult. The Chiefs and native people 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 Mount Cameroon Project 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 community forest in 1995. The community then worked with the MCP and MINEF through the planning process until March 2002. Actual management of the community forest started in August 2002.

1.9 Structure of the thesis

This thesis presents a multi-dimensional and multi-scale analysis of the influence of local realities on the implementation of the Clean Development Mechanism of the Kyoto Protocol as an example of an international environmental agreement. Each chapter presents a unique angle of view corresponding to the five main research questions.

Chapter 2 kicks off the multi-scale analysis with an examination of national forest policy instruments. It analyses the extent to which national forest policy in Cameroon can serve as a platform for community carbon forestry within the context of the CDM. The compatibility between forestry and related policy provisions in Cameroon and the CDM provisions for Land Use, Land Use Change and Forestry (LULUCF) is carefully examined. This focuses on the national policy dimension of the problem.

Chapter 3 specifically analyses specifically the forestry and land use data in Cameroon in terms of its adequacy to support carbon forestry implementation at macro, meso and micro levels. It explores the structure of an enabling CDM host country data support infrastructure for forestry implementation, and also assesses the supply potential of current forestry information in Cameroon as an example of a 'non-annex 1' country. It therefore presents an information management perspective of the research problem

Chapter 4 completes the multi-scale analysis by examining community capacity for CDM project initiation and management at the local level. It investigates the alleged asymmetry between community capacity and the requirements of the Clean Development Mechanism within community forests in Cameroon.

In chapter 5 the research looks towards finding solutions to some of the problems that emerge in the multi-scale analysis in the preceding chapters. It addresses data scarcity issues affecting project development by building on local knowledge. The chapter presents a case study in which Participatory-GIS (PGIS) was employed and the "value-added" to local spatial knowledge assessed as one route to enhancing indigenous knowledge for carbon forestry planning within the Clean Development Mechanism (CDM).

Chapter 6 delves further into PGIS potential for enhancing carbon forestry implementation through good governance support. It explores the potential for promoting local governance in community carbon forestry using participatory-GIS. It reviews ongoing community forestry PGIS process that incorporated carbon-planning activities for exploratory purposes in Bimbia Bonadikombo, Cameroon.

Chapter 7 presents a synthesis of the research and highlights and discusses the salient issues that emerge. It also points to interesting and necessary future research ideas.

The chapters in this thesis were written for publication as stand-alone articles; hence some of the material in this chapter is introductory and context-forming and needs to be further developed in the ensuing chapters as relevant. This initial chapter essentially lays out the conceptual foundations of this research in terms of problem formulation and structuring, research questions and methods, and the country and site-specific context of the analysis. The next chapter discusses the national policy dimension involved with implementing global environmental agreements such as the CDM.

Chapter 2

National Forest Policy as a Platform for Biosphere Carbon Management: The Case of Community Forestry in Cameroon*

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Abstract

Little attention has been given to the development of national policies relevant for the uptake, development and implementation of Clean Development Mechanism (CDM) projects. In this paper we examine the compatibility between forestry and related policy provisions in Cameroon and the CDM provisions for Land Use, Land Use Change and Forestry (LULUCF). For each CDM requirement such as eligibility, additionality, impact assessment and sustainable development, relevant national forestry policy questions are identified. These relevant policy questions are applied to community forestry policy instruments in Cameroon to analyse the likelihood that they can enhance or inhibit the uptake and implementation of biosphere carbon projects. We found that choosing a single crown cover value (from between 10 and 30%) presented a serious dilemma for Cameroon given its diverse vegetation cover. Adopting any single value within this range is unlikely to optimize national carbon management potential. The current forest institutional and regulatory policy framework in Cameroon is inadequate for promoting carbon forestry under current CDM rules. We conclude that national policy in Cameroon would need to recognise the need for and adopt a pro-active approach for biosphere carbon management, engaging in institutional development, integrated planning, project development support and providing adequate regulatory frameworks to enhance sustainable development through CDM projects. The need for CDM/Kyoto capacity building support for proactive national and local policy development is highlighted.

Keywords: Clean Development Mechanism, Land Use Land Use Change and Forestry, Policy Instruments, Community Forestry, Cameroon

2.1 Introduction

Current rules for carbon forestry projects within the Clean Development Mechanism (CDM) of the Kyoto Protocol are the result of a lengthy multilateral negotiation process, yet their implementation is expected at project level in developing countries. The assumption is that national policy will accommodate and mediate between the international and the project levels. This paper is about compatibility between Clean Development Mechanism (CDM) forestry project provisions and national policies on land use and land use change forestry. It examines the ways in which extant community forestry policy in Cameroon could support or inhibit the uptake and implementation of carbon forestry as a developing country example. But we begin by considering along what lines a supportive national policy is needed for CDM / Kyoto implementation.

The Kyoto Protocol provides for the use of sinks in developing countries as one way of meeting greenhouse gas reduction targets through the CDM. The CDM is one of three "flexible mechanisms" in the Kyoto Protocol designed to accomplish the objectives of the UNFCCC. It makes provision for investment by industrialised countries and industry in projects related to carbon emission reduction and carbon sequestration in developing countries. These projects should contribute to sustainable development in developing countries (i.e. Non-Annex 1 countries) while enabling developed countries (i.e. Annex 1 countries with quantified emission reduction targets) to meet the Kyoto emission reduction and quantified emission limitation targets (Art. 12.2 of the Kyoto Protocol). Annexe 1 countries or other entities would buy carbon credits from CDM projects through multilateral systems such as the World Bank or the European Union.

Biosphere carbon projects are required to meet certain conditions in order to acquire Certified Emission Reductions from the Executive Board of the CDM. Main conditions include *additionality* (mitigation effects with project must be additional to what would have happened without project); *leakage* (project mitigation effects must not be offset by impacts outside the accounting boundary); and *contribution to sustainable development* (to be demonstrated according to host country rules). Certified Emission Reductions represent the emission reduction or sequestration output of a project, and constitute the basis on which payments are made.

The negotiations that arrived at the above-mentioned requirements have been long, expensive and have included little more than one representative from most developing countries at each stage. The modalities deal mainly with issues relating to the carbon accounting, market mechanisms and specific project level-issues. As a result, little attention has been paid to relevant national and sub-national policy in developing countries, which are required to make carbon management within the CDM a reality. The extent to which policies can support the CDM and how much change or adjustments might be required of policy to enable such support in developing countries is not well known. Two relevant studies have been reported so far (Masripatin, 2005; Michaelowa, 2003).

Masripatin (2005) describes Indonesia's preparation for forestry projects under the CDM. She highlights the creation of a Designated National Authority (DNA) for Indonesia comprising a National Commission made of representatives from nine ministries; a Technical team made of representatives of nine ministries and WWF Indonesia as an NGO representative; and a DNA secretariat. The study also describes a national project approval procedure in which responsibilities are shared between the Ministry of Forestry and the DNA. The Ministry approves and recommends a project following appraisal of a project concept note and local district or municipal recommendation on eligibility of forest based on whether the proposed land is conflict free, absence of fires and land ownership conditions. The Ministerial approval must be completed within 30 days of receipt of the project concept note. The DNA will further assess the technical aspects of the project design document. The values for the definition of forest in Indonesia have also been given as, minimum land area of 0.25ha; 30% crown cover and 5m tree height. The process for the development of these policy responses entailed the creation of a CDM Working Group in the Ministry of Forestry that facilitated information dissemination, capacity building and policy development; a national strategy study on the CDM in the forestry sector by the Ministry of Forestry in 2003; and a nationwide forest eligibility for CDM identification using available forestry data.

Michaelowa (2003) examines CDM host country institution building requirements including case studies from Morocco, Indonesia and India. He finds an independent CDM office with full approval powers as the optimum institutional option for a DNA. A second best solution would be a two-tiered system- i.e. a CDM board with representatives of ministries that would define criteria and priorities whereas a CDM secretariat would evaluate (and possibly approve) project proposals and do outreach and marketing. Small countries could use the existing UNFCCC focal point and flexibly involve consultants if project proposals come in. He also finds that long-term professional staff in these institutions would be an important asset. Organised information exchange and capacity building for actors will increase competence and also investor confidence, while fights between ministries are likely to scare investors.

These studies present interesting dimensions of national policy responses to the current CDM requirements. Though the Indonesia case provides valuable information, it remains largely descriptive. Michaelowa's study is limited to national institutional questions and the criteria for sustainable development.

Policy makers would require a more holistic, systematic and analytical study to be able to develop relevant policy instruments to facilitate terrestrial carbon management. It is to these more holistic and analytical dimensions of the discussion that this paper aims to make a contribution. In-depth policy analysis- down to the small print is presented, demonstrating that such an analysis is necessary for every non-annex 1 country. This Cameroon case does not only show results, but also how such a study can be made.

This paper is structured as follows; section two presents the current CDM forestry requirements and the derived framework for assessing forest policy compatibility to the CDM. Section three presents community forestry policy in Cameroon, while section four elaborates the study methods. The study results are presented in section five and emerging issues discussed in section six. Section seven presents the conclusions of the study.

2.2 CDM Forestry Requirements and Forest Policy Assessment Framework

2.2.1 CDM Forestry Requirements

CDM projects are expected to meet a set of requirements prior to the issuance of certified emission reductions by the CDM Executive board. These requirements are articulated in the Kyoto Protocol and in subsequent decisions taken during the Conferences and Meetings of Parties. These requirements can be summarised under the following categories: eligibility, additionality, acceptability, externalities and certification. They are derived from a review of the CDM modalities (Decisions 19/CP.9 and 14/CP.10), the Marrakech Accords, and commentary and analytical literature on the modalities (FAO, 2004; Lee, 2004; Sedjo et al., 2001; Vine et al., 2001). In the ensuing paragraphs we briefly present the CDM requirements.

2.2.1.1 Eligibility

Eligibility of land for CDM is given by two aspects. Firstly, the suitability of the forest within the definition of forest provided by the host country as provided for under Decisions 11/CP.7 and 19/CP.9 of the Conference of Parties. These decisions require countries to determine national threshold values of crown cover, tree height and minimum land area, which together will constitute the definition of a forest. These decisions also provide ranges within which countries can choose as follows; between 10 and 30 % for crown cover; 2 and 5 m for tree height; and 0.05 and 1 ha for minimum land area. These values have to be determined and communicated by the Designated National Authority.

The second eligibility condition refers to the type of forestry activity. Only afforestation and reforestation (AR) activities are eligible under the CDM during the first commitment period. Afforestation would mean planting trees on land that has been below all the threshold values (crown cover, tree height and minimum land area) of the host country definition for a period of at least 50 years. Reforestation would mean planting on land that was below the threshold values on 31 December 1989.

2.2.1.2 Additionality

Sequestration or emission reduction due to project activities must be "additional" to any that would occur in the absence of the project (Paragraphs 18-22 of Decision 19/CP.9). In other words, additionality implies that projects must result in a net storage of carbon and therefore a net removal of carbon from the atmosphere. Other forms of additionality include programme, financial and investment additionality. *Programme additionality* means that emission reductions are additional to emissions required by law or government policy. *Financial additionality* is the requirement that funding for the implementation of projects must not come from overseas development or environment assistance funds. *Investment additionality* refers to where a project might justify additionality by showing that the creation of carbon offsets will involve costs that would not be incurred in the business as usual scenario. Though not a requirement per se it is a way of demonstrating "intent" and effort through financial analysis.

The draft tool for the demonstration of additionality in AR CDM projects (Annex 16 of CDM Executive Board Report No. 12) identifies some key steps that project developers could follow including:

- Preliminary screening based on the starting date of the project activity and the specific features of the afforestation and reforestation activity (Mapping and map analysis, land use and land tenure analysis);
- Identification of alternatives to the project activity consistent with current laws and regulations (land use analysis, estimates/measurements of carbon stocks, projections, baseline development);
- Investment / financial analysis (Internal Rates of Return, Net Present Value, cost benefit ratio, sensitivity analysis etc.)
- Barrier analysis (investment, institutional, technological, cultural, social, ecological and others such as risks of fire, conflicts etc); and
- Impact of CDM registration (Expected).

It is worth noting that most aspects of additionality are applicable at project level, while this paper deals with macro and meso (national and sub-national) policy. As a result, we focus on policy aspects that influence additionality such as land use and land tenure and forest risk management policies- see assessment framework in section 2.2.

2.2.1.3 Acceptability

The Kyoto Protocol states that all carbon offset projects in developing countries are required to contribute to sustainable development (Article 2.1 and 12.2 and Decision 19/CP.9). Host countries have to have criteria for sustainable development by which projects will be judged. In addition, projects must be consistent with other international agreements and guidelines such as the Convention on Biodiversity, Agenda 21, Ramsar and others.

Decision 19/CP.9 also lays out the responsibility of evaluating AR CDM projects with respect to risks associated with the use of potentially invasive alien species or genetically modified organisms. The preamble of the above-mentioned decision recognizes that host countries will have laws against which afforestation and reforestation will be evaluated.

2.2.1.4 Externalities (Environmental Impact and Leakage)

Projects must demonstrate a clear strategy to deal with all impacts/effects that may arise from project implementation. These impacts could include positive or negative social, cultural, economic or environmental impacts. Projects have to show how the negative impacts would be mitigated or countered.

A prominent aspect in externalities is the question of *leakage*. Leakage can be defined as unplanned emissions that could occur outside project boundaries as a result of project activities. Imagine a decision to cut down on fuel wood harvesting from a given forest in order to allow for regeneration. As a result, fuel wood harvesters may increase harvesting in a neighbouring forest area. This shift in activity to another adjoining forest will trigger loss of biomass / carbon that is being preserved in the regenerating forest. The loss outside the boundaries of the regenerating forest is known as leakage. Leakage can also result from demand and supply changes of land or certain related products. Leakage should not disqualify a project except in instances where projections of emissions are substantial enough to negate projected carbon offsets. However, project analysis must show how leakage has been estimated and what measures will be put in place to minimize it.

2.2.1.5 Certification

The concreteness, measurability and long-term characteristics of the project will have to be checked independently by a third-party (i.e. a Designated Operational Entity) accredited by the CDM executive board. This takes place in three stages during the CDM project cycle namely validation, verification and certification.

Validation is the process of independent evaluation of proposed project activity based on the Project Design Document against the CDM requirements. The outcome is the registration of the project.

Verification is the independent review process of monitored reductions or sequestration that occurred as a result of a registered project activity for a given period. This is an ex-post check to confirm whether or not and to what extent carbon offsets have actually been attained.

Certification is the process by which the designated operational entity gives written assurance of the emission reduction or sequestration achieved by the project during a specified time period as verified. The result is the issuance of Certified Emissions Reductions.

2.2.1.6 Small-Scale Afforestation and Reforestation projects

Following discussions on the complications and costs involved in responding to the rules or requirements outlined above, modalities were then simplified for "small-scale projects". Decision 14/CP.10 defines small scale A/R projects as those that will result in net greenhouse gas removals by sinks of less than 8 kilo tonnes of carbon dioxide per year during the crediting period. Moreover, the host country has to confirm that the project developers are a low-income community or individuals.

From the above, it will be clear that CDM requirements are framed basically for projects (micro level), but this paper is focused on elements of national (macro level) forest policy that could facilitate or inhibit the implementation of these requirements at the project level. We further analyse these requirements to elucidate national forest policy determinants of compatibility to CDM, which are used to assess community forestry policy in Cameroon.

2.2.2 A Framework for Forestry Policy Compatibility Assessment

In this section, we review the CDM requirements in order to elucidate parameters of national policy suitability or compatibility. Our presentation is based on direct references and analytical judgements about which national policy provisions would facilitate or inhibit the fulfilment of these project level CDM requirements. Table 2.1 presents the framework for forest policy compatibility assessment derived from this analysis. It consists of a number of questions that can be asked of national policy for every CDM requirement category.

A first requirement for a country to partake of CDM projects is the creation or definition of a Designated National Authority (DNA) with overall responsibility for CDM activities at the national level. All countries have to constitute and identify such an institution, which will be the main link between the host country and the CDM process at international level. This body will also oversee project approval. Michealowa (2003) notes that the structure, functions and capacity of these institutions could vary from country to country.

Eligibility: In terms of eligibility host country authorities are given a direct responsibility to determine threshold values of crown cover, tree height and minimum land area to make up what will constitute a definition of forests. This is a precondition for participation within CDM A/R activities.

The second aspect of eligibility relates to small-scale projects. Decisions 19/CP.9 (Annex Ai) and 14/CP.10 indicate that host country governments need to approve that project developers are low income communities or individuals in order for the project to be validated. They would thus have to determine what criteria would define such a community.

Additionality: We base our analysis on land use and land tenure rights and risk management because most aspects of additionality are applicable at the project level. Decision 19/CP.9 (Paragraph 20e) and the draft tool for the demonstration of additionality in AR CDM projects indicate that all project baselines must take into account all applicable laws and regulations as well as relevant national and/or sectoral policies and circumstances.

These include land-use and related regulations, tax and investment regulations historical land uses, practices and economic trends. This means the designated national authority or ministry in charge of approval must have information to check these compliance points for every project in the country. It may also imply well functioning institutional structure across scales. Variables might be different in different parts of the country. For example, in Indonesia district authorities are required to give clearance to the Ministry of Forestry on issues relating to conflicts over land/ ownership of resources and the degree of risks in terms of fire (Masripatin, 2005).

Land and resource tenure rights are important for carbon forestry. FERN (2000) highlight how unclear ownership and tenure rights led to conflicts over land and consequent failure of a carbon project in Uganda.

Table 2.1 Framework for national forest policy-CDM compatibility assessment

CDM requirements	Compatibility question or determinant
Institutional Development	a. What is the nature of the Designated National Authority?
	b. How do current institutions support CDM projects?
Eligibility	c. What is the country definition of a forest?
	d. What is the country definition of a low-income community or Individual?
Additionality	e. How are the land and resource tenure rights implemented?
	f. How does forest policy cater for forest resource management risks?
Acceptability	g. What are the sustainable development criteria and indicators for the host country?
	h. What laws regulate the use of potentially invasive species and genetically modified organisms in the forestry sector?
Externalities	i. How are environmental and social impact assessment regulations applied in resource management?
Certification	j. What procedural regulations exist for CDM project approval?

The potential role of policy provisions in helping with risk of project failure is an important consideration. CDM projects are likely to face a number of risks including political, legal, institutional, financial, market and physical risks. Policy changes at the international level and property rights at the national level are examples of political risks. Non-respect of contracts, non-compliance with guarantees and expropriation are examples of legal risks. Carbon prices are speculative and unpredictable therefore, a source of risks for projects especially when juxtaposed with project performance in terms of certified emission reductions delivery, as well as cost and time investments. Fire and disease are examples of physical risks.

Acceptability: Article 12 of the Kyoto protocol stipulates that CDM projects must contribute to sustainable development in host countries. Host countries are given the responsibility in Decision 19/CP. 10 to define sustainable development criteria and ensure that projects adhere to these criteria as a condition for CDM project registration. Therefore countries have to define a procedure for project approval.

A second aspect of acceptability that is to be assessed is compliance with regulations governing the use of potentially invasive species and genetically modified organisms in the forestry sector.

Externalities: Project developers have to demonstrate that the projects will not have any adverse environmental and social impacts if they get registered as CDM projects. Alternatively, if such negative impacts are likely, they need to show how they will be mitigated. This implies that rules for impact assessment ought to be in place at the national level or sub-national level. Countries also have to approve the analysis. This also means that there has to be a procedure for such approval.

Validation: National project approval is an important part of the validation process in the CDM. National approval would cover issues relating to sustainable development, impact assessment, and stakeholder involvement and consultation. This implies once more that a procedure needs to be in place to cater for project approval. Such a procedure would specify roles and responsibilities of the various national actors. Hence, in the case of validation we can also ask whether a procedure for project approval exists at the national level.

It is worth noting that many of these assessment issues are closely related and sometimes difficult to distinguish. There are crosscutting issues that are relevant to all the project requirements. These could include procedural and institutional issues. We attempt to reflect this in our analysis based on insights from community forestry policy in Cameroon. Notwithstanding the focus on community forestry, we occasionally refer to more general forestry policy when the need arises.

2.3 An Outline of Community forestry Policy in Cameroon

2.3.1 Community forestry within forest landscape

Community forestry was born through a long process of forest reforms that started in 1988 with the development of the Tropical Forestry Action Plan. The reform process had five broad national forest policy objectives and corresponding strategies for their achievement (Government of Cameroon, 1993; 1995). These were:

- To safeguard/protect the forest heritage, environment and biodiversity;
- Strengthen the participation of local population in forest management and conservation so that forestry can contribute to raising their living standards;
- Enhance forest resources and their contribution to the national gross domestic product while preserving productivity; and
- Ensure the regeneration of forest resources by plantations in order to perpetuate potential; and

- Revitalise the forest sector by setting up an efficient institutional framework.

The process resulted in the revision of the forest law of 1981. A new forest law was enacted and promulgated, -Law No. 94-1 of 20 January 1994. The Prime Minister signed a corresponding implementation decree specifying details of the new law in 1995 (No. 95-531-PM of August 23 1995). Together, the 1994 law and its implementation decree laid out a new classification of forests, logging rights and conditions and norms for management of forests in Cameroon. This classification and conditions are summarised in Table 2.2.

In 1995, the Prime Minister signed into law another instrument enacting the Indicative Land Use Framework (plan de zonage) -Decree No. 95-678-PM of 18 December 1995. This is a proposed broad land use plan drawn by the state but open to negotiations during implementation at the local level (Atyi, 2000). It is based on the rules and conditions stipulated in the 1994 law and its implementation decree of 1995. It is meant to plan all of the various forest types in Table 2.2 for the entire country, but only about 30% of the national territory has been covered within this zoning framework to date.

Community forestry in Cameroon was chosen for this study because the policy provisions for community forestry provides a good institutional and regulatory framework for project appraisal, approval and verification by the Sub-Directorate of community forestry in the Ministry of Forests and Fauna. Rules and regulations are elaborated in the Manual of Procedures and Norms for the Management of Community Forests (MINEF, 1998). No other forest management unit in Cameroon has such a regulatory framework. At the same time the framework leaves open the possibility for private investments to be made in community forests as long as they are agreed between the community forest legal entity and the private investor. These characteristics identify community forests with the CDM framework.

Secondly, many authors have argued that community forest management has the potential of fulfilling the triple objectives of biodiversity conservation, supporting local development and providing forest services such as carbon sequestration (Klooster and Masera, 2000; Smith and Scherr, 2003). Hence, if well managed it could contribute substantially to the achievement of CDM objectives.

Table 2.2 Summary of forest types and conditions in Cameroon

	Forest type or unit
A	*Permanent Forests* (Also known as classified forests) Forests set aside for long-term use and should constitute at least 30% of total forest area in the country.
I	State Forests (forêts domaniales) Comprise protected areas including national parks, forest reserves and sanctuaries with conservation as primary objective. They would require management plans
Ia	*Production forest reserves or Unité Forestière D'Aménagement (UFA).* To enable sustainable lumber production. Forest concessions can be granted for an area of up to 200000 ha to licensed timber operators in these areas. Management plans are a requirement.
Ib	Council Forests (forêts communales) Planted or natural forests managed by municipalities in their area. Planned logging and restoration/afforestation activities are allowed in these forests
B	Non Permanent Forests Includes all unclassified forests that could be converted temporarily or permanently to purposes other than forestry.
I	Private forests (forêts privées) Planted forests belonging to individuals in which logging, tree planting and management activities are allowed based on a management plan.
II	Communal Forests (forêts du domaine nationale) This is a residual class of forests including all forests not included in permanent or private forest estates.
IIa	Community Forests (forêts communautaire) Forest area within the communal forest estate, which is the object of an agreement between community and state. Maximum area is 5000 ha per forest. Management contracts run for 25 years renewable. It is the only forest estate communities own and is fully entitled to revenue from natural forest products. Communities may open their community forests to a sale of standing volume and other activities, provided they are agreed upon and included in the management plan.
IIb	*Sale of standing volume (ventes de coupe)* An area of not more than 2500ha for which logging rights have been granted to a Licensed Timber Operator. No management plan is required.

NB: Communities have usufruct rights to all forest types in the country.

Source: Adapted from (Brown, 1999) and (Djeumo, 2001)

Thirdly, there is a growing potential as more forests in Cameroon are coming under community management following new forest legislation in 1994 introducing community forestry. By January 2006, there were 334 applications by communities in the Ministry of Forests and Fauna (MINFOF). Of the 334 applications, 90 community forests were under full community management. This means that the number more than quadrupled from 17 in December 2001. At this rate, total area under community forestry could attain 1 million hectares in five years (i.e. 200 community forests at a maximum of 5000ha). However, a good number of the community forests are being hijacked by financially lucrative deals from timber exploiters –about 44% of all community forests by December 2003 (MINEF, 2003 pg 69 - 73). This runs contrary to the sustainable management objectives that justified the introduction of community forestry. Carbon forestry might provide a lucrative alternative or at least some competition with timber exploitation in this sector.

A disadvantage of choosing community forestry is that a large part of community forests in Cameroon practice forest management (Sonwa et al., 2001), which is not currently eligible for CDM. Relatively fewer community forests practice afforestation or reforestation, currently eligible for the CDM. However, we think those prospects of and pressure for forest management coming into the Kyoto Protocol framework (post 2012) and the potential of the non-compliant or voluntary carbon market is good, thereby justifying this study.

2.3.2 Main Features of Community Forestry in Cameroon

Community Forest is defined as "that part of non-permanent forest estate (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" (MINEF, 1998).

Government approves a community forest application and signs a management agreement upon community fulfilment of the following requirements:

- The community has constituted a legal entity and appointed a community forest manager who shall represent them in negotiations with government in matters of community forestry;

- The community has delineated and mapped the intended community forest area;

- The community has completed an 8-10% inventory of the timber, non-timber forest products, and wildlife of the forest;

- The community has provided a description of previous activities carried out in the intended forest area;

- The community presents a simple management plan for the intended forest; and

- The community shows proof of stakeholder agreement on the intentions of forest management.

Once the management agreement is signed, policy requirements are as follows,

- That 100 % inventories are carried out in the compartments prior to the commencement of activities;

- The management of community forests provide annual activity plans for approval;

- The management of community forests provide annual reports to government; and

- The community forest management plans are reviewed every five years.

2.3.3 Forest Institutions in Community Forestry

At the national level, forest policy development and implementation is steered by the Ministry of Forests and Fauna (MINFOF) - known until 2004 as the Ministry of Environment and Forests. Its role includes coordination with other ministries such as Economy and Finance on forest revenue issues and Higher Education and Scientific Research on training and research through universities and the Research Institute for Agriculture and Development (IRAD). In terms of ground implementation, the ministry has offices at the provincial, divisional and sub-divisional levels. A government agency called L'Agence Nationale D'Appui au Développement Forestier- ANAFOR (known until June 2002 as ONADEF) handles technical issues such as inventories and silviculture.

The advent of community forestry in 1994 prompted the creation of a special community forestry unit now known as the Sub-Directorate for Community Forestry in the Ministry of Forests and Fauna (MINFOF). It handles the community forestry attribution process as prescribed in the Manual of Procedures and Norms for the Management of Community Forests (MINEF, 1998).

At the local level communities must constitute legal entities representative of all concerned sections of the community in order to manage a community forest. According to Article 28 (1, 3) of the 1995 Decree, communities can constitute themselves into one of the following legal entities: an association, a co-operative, a common initiative group or an economic interest group.

The 1994 law created a Special Forestry Development Fund, a national instrument for the promotion and development of forest resources management. An inter-ministerial committee chaired by the Minister of Forests and Fauna manages the fund. A decree signed in April 1996 (No. 96-237-PM of 10 April 1996) specified the modalities for its functioning. Essentially it mobilises a proportion of current forest revenue and redeploys such funds into special forestry projects.

Armed with the provisions of the CDM and related policy instruments, we move on to analyse the extent to which community forestry policy in Cameroon meets these demands.

2.4 Methods

This study aims at assessing forest policy compatibility to CDM requirements as a platform for proactive biosphere carbon management, using community forestry policy in Cameroon as a host country case.

The main data sources in this study include: policy documents (laws, decrees, Conference of Parties /Meetings of Parties Decisions, technical reports from various institutions etc); existing commentary or analytical literature on policy and policy implementation; and interviews with key informants- when specific information was required. Content analysis was employed on the data in the extraction and organisation of information from various sources. This entailed coding according to the various criteria and assessment questions in the policy assessment framework in table 2.1.

The assessment of policy is mainly based on the framework elaborated in section 2.2.2. However, we have chosen to introduce policy analysis theory in order to accommodate a more nuanced view of multi-actor policy processes that might not be apparent from a more pros and con "quasi-objective" argument with the use of the framework alone. A rather limited version of Contextual Interaction Theory (Bressers, 2004) is thus used. Its principles of motivation, power and information are used to complement the arguments for each of the questions in the forest policy-CDM compatibility framework.

2.4.1 Contextual Interaction Theory - CIT

Contextual Interaction Theory explains the process of implementation of policy instruments and attempts to predict whether in a given case there will be any implementation at all, and under what conditions adequate implementation will occur. It can also be used to determine the degree of adequacy of the implementation of policy with respect to "targets". Contextual Interaction Theory is based on the assumption that the course and outcomes of policy implementation depend not only on the characteristics of the policy instruments (inputs) but more importantly on the characteristics of the actors and interactions involved, especially the *motivation* (perception and interpretation of instrument, values, preferences and incentives), *power* (the relative ability of actors to influence policy as determined by bargaining strength and resources) and *information* (availability, access and control) (Bressers 2004; Bressers and O'Toole, 2005). The interaction of these three variables of motivation, power and information results in a prediction of the policy implementation process.

The predictive model depicts possible interactions for implementation of the various instruments including *cooperation* (active, passive and forced), *opposition* and *joint learning*. Cooperation is supposed to be active when actors share a common goal among other things, "passive" when one or both parties adopt a very passive stance, which neither hinders nor stimulates the policy application and "forced" when a powerful actor imposes cooperation. Opposition is assumed to be when one or more actors try to prevent policy instrument application, and joint learning, is when only lack of information stands in the way of instrument implementation. These criteria have been applied in the assessment of different policy instruments, to give a more nuanced appraisal of the likelihood of success.

2.5 Assessing Community Forestry Compatibility to CDM.

This section analyses the potential of forest policy to support or inhibit the implementation of CDM forestry requirements in Cameroon. We analyse relevant policy instruments in relation to the requirements and compatibility assessment questions in the framework laid out in sections 2.2.2 and Table 2.1- i.e. institutions, eligibility, additionality, acceptability, externalities and certification.

2.5.1 Institutions

Definition of a Designated National Authority (DNA): Cameroon's Designated National Authority- DNA is called the "Comité National MDP Cameroun". Created in January 2006 by Ministerial Decision No. 00008/MINEP/CAB, it is a

12 member Inter-Ministerial Committee with representatives from six ministries namely Environment and Nature Protection, Economy and Finance, Forests and Fauna, Energy, Industry and Commerce; one representative each from NGOs, the association of Cameroonian entrepreneurs, and the industrial union. The Director of Sustainable Development and Environmental Planning in the Ministry of Environment and Nature Protection is President of the DNA, while the Climate Change Focal Point is the Secretary and Secretariat. It is early days yet to judge the performance of the Comité National MDP Cameroun given that it has only been functioning for a few months. However, Inter-Ministerial committees often face coordination challenges and the problem of impermanence of personnel. In Cameroon personnel change very often, hence the motivation and experience could be lost. These sorts of problems have been experienced in Morocco and Indonesia (Michealowa, 2003). Article 3 (2) of the Decision creating the DNA stipulates that representatives of institutions on the DNA cannot be switched without the consent of the head of the DNA. But this falls short of imposing a term for persons serving on the DNA, neither does it allow for change overtime during which new members can learn from outgoing members. Moreover, such a commission can only operate at the strategic level, the actual registration and follow up issues will have to be addressed by a permanent and specialised unit.

Current role of Institutions in CDM project Development: The DNA has been conducting training workshops on project design and facilitating the development of energy projects since its creation through a project called "Using carbon finance to promote sustainable energy service in Africa" involving the Community Development Carbon Fund of the World Bank, UNEP Riso Centre, ECONOLIER International (a Canadian consulting firm) and local NGOs. About 10 energy projects are in the early stages of PIN or PDD development. But little has been done relating to promoting CDM forestry projects in Cameroon. As was the case with forestry reform, there is a developing partnership between bilateral aid institutions and NGOs in the sub-sector. Much of the little groundwork on forestry has been done by NGOs and projects have been more concerned with feasibility studies.

One such organisation is the Cameroon Mountain Forest Conservation Foundation (CAMCOF). It commissioned a study to evaluate the potential for a carbon programme in the Cameroon Mountains region in 2001 (EcoSecurities, 2002). Modelling results showed that most carbon sequestration could only be done through regrowth and conservation of natural forest on about 4300ha or 2.5% of the forest area. Regrowth and conservation are not eligible under the first commitment period CDM rules. This suggests that forest policy must be proactive and look at the opportunities that exist in the non-compliance market or concepts of reduced emissions through deforestation and degradation in post 2012 carbon policy scenarios. There exists under-recognised data in the project areas that could facilitate baseline and carbon additionality analysis. The TREMA database of the Mount Cameroon catchment area consists of geo-referenced forest inventory database with 20000 data records from approximately 300 forest samples. It has built in functions to derive indices of "bioquality" and can be easily modified using additional field information and regression equations to serve carbon management purposes (EcoSecurities, 2002).

Research by the World AgroForestry Centre (ICRAF) on carbon dynamics in a chronosequence of slash-and-burn agriculture in the humid forest zone of Southern Cameroon could be useful for national policy development (Kotto-Same et al, 1997). An example for use of this sort of data would be for further refinement of local standard baselines for small scale projects as expressed in Decision 14/CP.10. More has to be done by NGOs and government in terms of sensitization and institutional capacity building for project uptake and implementation.

It suffices to mention that the Cameroon Mountain Conservation Foundation has been using British aid funds in these carbon studies. NGOs and bilateral and multilateral projects have also used overseas development assistance funds to support community forestry projects in Cameroon. MINEF (2003) reckons that 40% of community forests in Cameroon have been developed through overseas development finances. Projects developed using overseas development finance are not eligible for CDM projects under the financial additionality criterion. This could be a problem.

2.5.2 Eligibility

Country Definition of Forest: Cameroon is yet to define and communicate a definition of forest to the CDM Executive Board. Section 2 of the 1994 forestry law (No. 94-1 of 20 January 1994) defines a forest as,

"*any land covered by vegetation with a predominance of trees, shrubs and other species capable of providing products other than agricultural produce*".

It does not mention any of the parameters of crown cover, tree height and minimum land area as requested by the CDM. The current legal definition would not be acceptable.

The requirement of choosing single values each for crown cover (between 10 and 30%), tree height (between 2.5 and 5m) and minimum land area (between 0.05 and 1ha) will be problematic for Cameroon. The country is comprised of six agro-ecological zones ranging from humid tropical forests in the south through savannah type vegetations in the middle to sahelian type vegetation in the north. Choosing a higher threshold value of 30% crown cover is likely to exclude most of the 60% comprising highland savannah forests and tropical rainforests, yet 30% is the best option to maximise land eligibility under current CDM rules.

Verschot et al., (2005) showed that between 70 and 90 percent of all lands in Bolivia, Uganda, and Ecuador were not eligible for CDM projects at a low crown cover threshold of 10 percent. While only 28 percent of land in Kenya was excluded at the same crown cover threshold value, mainly because a larger proportion of its lands are dry lands. EarthTrends Country Data (WRI, 2003) estimates that about 37 182 000 ha of land in Cameroon in the year 2000 was above 25 percent crown cover. Granted that total forest are in Cameroon is estimated at 21 245 000 ha, we can conclude that most community forests areas and indeed current forest areas are unlikely to be eligible for CDM if a crown cover threshold value of less than 25% is chosen.

The forest definition issue requires careful data analysis of the carbon sequestration potential of various agro-ecological regions in the country, as well as comparative cost implications for various threshold crown cover values (Neeff et al., 2006). These data are not available at the moment. Completing such a study might help reach a decision at the national level, but questions of resource availability for such studies remain open. An alternative could be to orientate policy towards non-compliance mechanisms or post 2012 CDM scenarios that might introduce more favourable eligibility criteria.

Definition of a low-income community or individual: No definition has been discussed within national policy in Cameroon. However, given that rural populations in Cameroon generally live on less than a dollar a day, it is probable that most communities would qualify for small-scale CDM.

2.5.3 Additionality

Land Tenure and Resource Rights Implementation: Land tenure in Cameroon is characterised by multiple layers of rules namely, the 1974 land ordinances, the Indicative Land Use Framework or *Plan de zonage* and local cultural and traditional land tenure systems.

Following the 1974 Land ordinances, all uninhabited forestland without statutory titles, belong to the state. As a result this land has been conceptualised under the generic notion of “collective ownership” (Chi, 1999; Fisiy, 1997).

The *plan de zonage* further categories land into permanent and non-permanent forests as in Table 2.2. A main weakness of this instrument is that only about 30% of the country (about 14 million ha) has been zoned through this scheme.

The *plan de zonage* is negotiable on the ground (Articles 1 (2) and 6 (2) of Decree No. 95-678-PM of December 18*)* during regional land allotment planning or boundary delineation for various forest types, but institutional capacity for facilitating such processes are weak and very few experiences of the sort exist (Lescuyer et al., 2001). All areas not designated as permanent forest in the *plan de zonage* or by other decrees are subject to local traditional regimes of land rights. This allows for considerable overlap in rights and entitlements.

In the local traditional regimes, chiefs have political and ritual powers and claim some kind of sovereignty over the land in the non-permanent forest estate. Traditionally effective ownership and administration comes in one of three ways:

- Firstly, by virtue of first occupation for original family lineages;
- Secondly, by community members by birth, marriage or co-optation following local access practice through family lineage, elders or traditional councils; and
- Thirdly strangers or non-natives can pay tribute to the rulers to be granted usufruct.

It is common for unscrupulous strangers to interpret the ownership of the state as permission to access the area without approval from local level. This duality between national and local levels and overlaps would pose serious barriers and risks to carbon project development and management.

Furthermore, there could still be a problem of entitlements to carbon benefits due to regulatory weakness relating to the definition of rights to forest products. Section 9 (1-2) of the 1994 Forestry law defines forest products as comprising:

"Mainly wood and non-wood products as well as wildlife and fishery resources derived from the forest. Certain forest products such as ebony, ivory, wild animal horns, as well as certain animal, plant and medicinal species or those, which are of interest, shall be classified as special. The list of special products shall be fixed, as and when necessary, by the competent ministry" (Section 9 (1-2))

The discretionary power of the minister may also allow the inclusion of carbon services into the special products list. If this happens within CDM projects and indeed community forests, then communities are doomed because they do not have the right to sue government in a court of law in matters regarding community forests (Vabi et al., 2000). More so, in the case of community forests, the minister reserves the right to terminate the management contract with communities in cases where they do not respect the management plan. Should one or both scenarios occur, there will be no certainty, and as a corollary, no incentive for carbon investments. What becomes of ongoing certified emission reduction if and when a contract is terminated? Such issues must be clarified if CDM projects are to function smoothly in Cameroon.

While information on land tenure and forest resource entitlements is largely known to actors, excessive discretionary power of MINFOF and lack of clarity on forest service earnings is likely to be an obstruction to CDM implementation.

Forest resource risk management: Fires remain a major cause of forest destruction in Cameroon, hence a great policy challenge to government. Communities use fire as a technique for clearing in subsistence agricultural land preparation, for enabling fresh grass growth for cattle and to a limited extent, hunting in montane forests. Communities also recognize the destructive capacity of fire for their crops and forests in many places. As a result, there are fire management policies both at the level of government and within communities.

Article 6-8 of Decree No. 95-531-PM allows for local ministry of forestry staff to determine modalities for safe and controlled fires. The same articles empower local government administrators in the Ministry of Territorial Administration and Decentralisation to issue permits to start fires after consultation with the local forestry staff. But they very often issue permits without consulting forestry staff. Joint MINFOF-Community fire prevention and monitoring committees are supposed to be set up at local level but they have hardly been effective because MINFOF is highly understaffed. For example, the ratio of MINFOF staff to forest area in the South West Province is around 1:15 000ha.

Gardener et al., (2001), report more successful fire fighting control techniques within community forestry in the Kilum-Ijim forest area in the northwest province of the country. These communities are using regular fire tracing, sensitization and patrols to successfully reduce fire occurrence and destruction of forests, grazing land and farms in the area.

This dichotomy in forest fire management capacity has implications for potential carbon forestry projects. Permanent forest estates under government control may suffer while community forestry areas under carbon forestry may benefit if these lessons are multiplied and community capacity enhanced. Failures in fire prevention may dent investor confidence in carbon forestry in the country.

2.5.4 Acceptability

Sustainable Development Criteria: Sustainable development criteria for CDM projects assessment in Cameroon have been defined in Annex 1 of Decision 00008 / MINEP /CAB, but are yet to be tested on any carbon forestry projects. It consists of 11 criteria that together have 26 indicators. The criteria are grouped as follows 5 social criteria (equity and poverty reduction, relevance to national and local development, relevance to national and local sustainable development policy, well-being of local community, and social integrity of the local community); 3 economic and technological criteria (contribution to local economic viability, contribution to national economic viability, and technology transfer); and 3 environmental criteria (fight against climate change, preservation of the environment and natural resources and security and health. The actual scoring of the 26 indicators is done by a set of questions to which a binary response of yes or no is required.

Further analysis revealed that the indicators were not tight enough and redundant in some cases. There is no specification of the evidence required for various criteria, neither is there any threshold specification as to when a project can be considered acceptable. This leaves a potentially high degree of subjectivity in the assessments when compared to multi-criteria methods used by Egypt, or the scoring approach in the SouthSouthNorth matrix tool or the Gold Standard (Olhoff et al., 2004; SSN, 2003; Sutter, 2003). Examples of redundancy in indicators and sub-indicators can be found in the criteria. The Indicator “increase or creation of employment” occurs twice for criterion 1 and also for criteria 4 and 6. A review of these criteria and indicator set would be necessary to make them tighter and beneficial for the country.

The challenges of ensuring that projects approved using these criteria actually contribute to sustainable development cannot be ignored. Experience from community forestry provides some evidence in this regard. The community forestry manual of procedures introduced a number of requirements that could also be seen as enhancing sustainable forest management. Communities were required to carry out inventories and produce simple management plans, develop and show a benefit- sharing mechanism for proceeds that will come from the community forest, and demonstrate that all involved had participated in the decision-making during the planning process. In addition, annual exploitation plans are not expected to go beyond forest productivity rates. To date all community forests approved have fulfilled these conditions, but a number of shortcomings have appeared.

Firstly, an evaluation report at the end of 2003 showed that 80% of these communities were not respecting the management plan (MINEF, 2003). Many communities have exploited timber beyond the recommended volumes because community forests are more attractive to timber exploiters. Timber exploiters find community forests cheaper and easier to work with. In addition, some villagers encourage and cooperate with illegal loggers for personal financial benefits (Brunner and Ekoko, 2000; Fomete, 2001).

Carbon funds could present greater benefits within the simplified procedures for small-scale CDM projects. It could enable carbon forestry projects to compete with and / or edge out sale of standing volumes and illegal logging, thereby contributing to sustainable development.

Regulations on Potentially Invasive Species and Genetically Modified Organisms: The CDM presumes that host countries have laws that enable them to assess the risks of projects that use potentially invasive species and genetically modified organisms. In Cameroon reference to both invasive species and genetically modified organisms is very indirect. Article 16 of the August 1995 Decree states as follows:

"The conditions for organizing the prevention and control of diseases and insects threatening forest plantations and species shall be determined by order of the Minister in charge of forestry".

Such an order is still awaited. Although this is not a condition that can justify the non-registration of a project, it is in the interest of host countries to define such policies for the benefit of sustainable ecosystems management as a whole.

2.5.5 Externality- Impacts assessments

National approval has to take project impact analysis into account. This means that policy must be available to guide the appraisal and evaluation process. Article 110 (1) of the August 1995 Decree states the following with regards to impact assessments:

"Within the context of a development plan likely to disturb or destroy a forest, a preliminary impact study on the environment shall be carried out by the applicant, according to the rules laid down by the department in charge of the environment, in order to determine what special steps should be taken to ensure the conservation, management or as the case may be, salvage of natural resources" (Article 110 (1) August 1995 Decree).

The rules required for such impact studies are yet to be determined. However, a Department of Norms was created in the Ministry of Environment alongside the Secretariat for Environment in 1999 to establish all environmental and forestry related norms demanded by the 1994 law. But nothing has been published in this regard. Any Designated National Authority for CDM could work with this government department to establish the impact assessment conditions required.

Despite the weak institutional and regulatory framework in this regard, two initiatives have been carried out in the country initiated by external funding bodies: the Mokong dam project in the North province (IUCN) and the Chad Cameroon Pipeline Project (Bitondo, 2000). Guidelines of donor institutions were used viz. the World Bank Operational Directives on environmental assessment - OP 4.01 and the Operational Policy on Economic Evaluation of projects -OP 10.04 (Dames and Moore, 1997). The government of Cameroon put the Mokong Dam project on hold as a result of the environmental assessment (Bitondo, 2000).

The motivation of civil society in both cases enabled the adaptation of international frameworks / criteria to local settings with some success. The fact that government recognised the results of both studies indicates that they could be acceptable if used for CDM project impact assessments.

2.5.6 Certification - Project review and approval procedures

The project review and approval procedures for CDM projects in Cameroon, presented in figure 2.1, were defined in annex 2 of Ministerial Decision No. 0008/MINEP/CAB of January 2006. The secretariat of the DNA serves as a one-stop shop for project review and approval. The members of the Comité National MDP Cameroun (the DNA) do the project reviews. However, the DNA can co-opt any competent persons or institutions it needs to fulfil its tasks. The procedure has only been operational for a few months; hence it is early days for an evaluation. Some ten energy projects are currently navigating the review process but are still at very early stages and no forestry projects have yet been initiated. The dynamics of forestry projects will be different and more complicated, therefore more challenging.

It was found that current procedures do not give sufficient attention to land and forest rights issues, unlike the Indonesian procedures for example (see chapter 2.5.6). In the Indonesian case some power for evaluating and approving land ownership and forest entitlements has been given to local authorities (Masripatin, 2005), which could be just as prudent and efficient in the case of Cameroon where land right regimes vary enormously (Fisiy, 1997; Chi, 1999). Moreover, if this is done within community forests, fewer problems are expected as the community forestry procedures have built in mechanisms to minimize these problems.

The only experience of project appraisal and approval in the forestry sector that the DNA could learn from is the case of community forestry. The Sub-Directorate of community forestry in the Ministry of Forests has reviewed over 300 community forestry applications so far. Its reviews are based on prescriptions laid out in the Manual of Procedures and Norms for the Management of community forests (MINEF, 1998). An outline of these requirements was presented in section 2.3.2.

The Ministry must make a decision within six months of receipt of the application. If communities do not receive a letter rejecting their application with justification, they can assume it has been granted, and therefore continue with the development of the management plan. If rejected, they could correct the application based on the recommendations of the Minister and re-submit. A second strong point of the approval process is that it provides for consultation and crosschecking with all government departments at the local level.

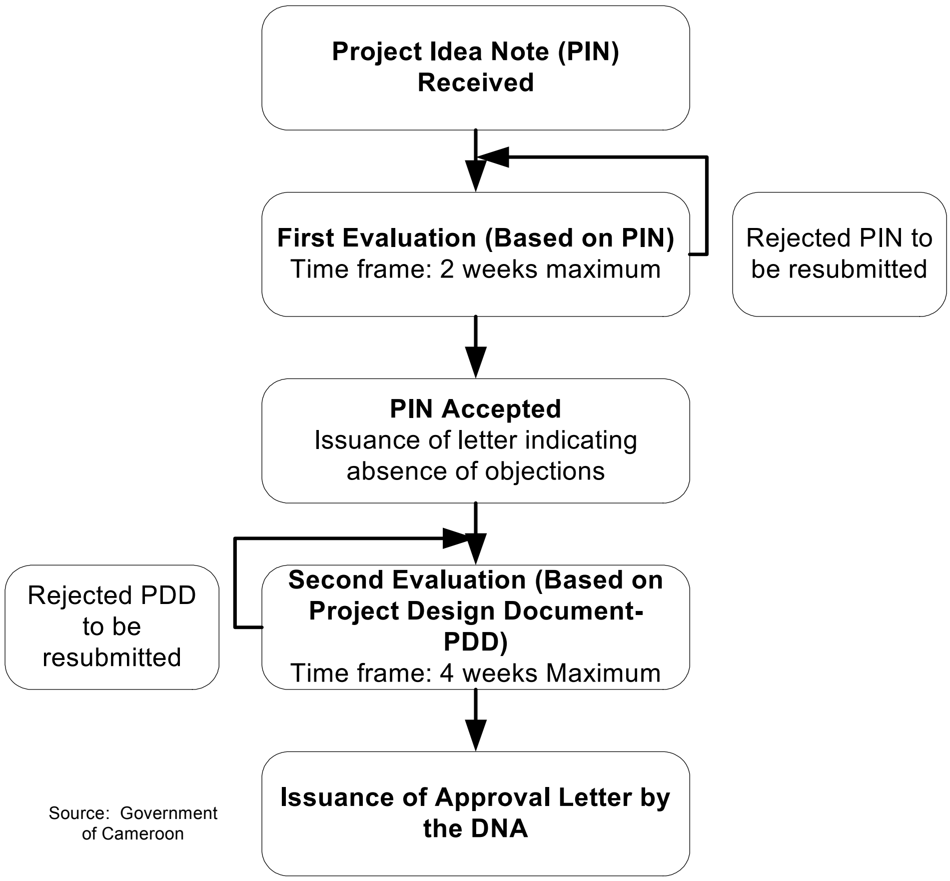

Figure 2.1 CDM project review and approval procedure in Cameroon

There have been some problems with the requirements for approval. These include chiefly complaints of the process being costly and some requirements simply redundant. For example, communities produce GIS based boundary maps that are up-to-date in terms of land use at scale 1:50 000, and are required to certify them at the Institut National de Geographie. There, technicians use points from the community map to hand-trace new boundaries on topographic sheets of 1975 for which they issue an attestation of surface area. As a result communities spend money to get final a product that is less accurate than their initial map (McCall and Minang, 2005). Such problems have led to the revision of the manual of procedures. The Ministry of Forests is preparing a new version. The experiences of this process could help the DNA gauge what will be workable for CDM forestry.

2.6 Discussion

The previous section examined the potential of policy instruments to support or inhibit the implementation of CDM requirements by attempting to answer a number of key questions of national forestry policy, and Table 2.3 summarises the analysis. Salient constraining factors and supportive policy dimensions for carbon forestry project development are highlighted and discussed in the text that follows.

2.6.1 Constraining factors which limit the potential

Firstly, a number of regulatory issues need to be addressed to facilitate biosphere carbon project management. These include: specifying the definition of forest and low-income communities and individuals for small-scale project eligibility; impact assessment rules, and policy on genetically modified organisms and invasive species within forestry. These regulatory requirements are an absolute necessity in the CDM modalities (Decisions19/CP.9 and 14/CP.10).

In addition, a number of regulatory measures that could help promote carbon forestry are required in the case of Cameroon. Clarification will be required on rights of ownership and access to earnings from forest services. Current policy provisions refer only to product ownership and access, and they also allow excessive discretionary power to forest administration and political appointees to withdraw rights of ownership. Clarification about ownership and entitlements to earnings from forest services including carbon will provide an incentive for carbon project development and could help reduce risk of project failure and conflicts. Smith and Scherr (2003) argue that securing forest access and ownership rights for local people and establishing forest carbon rights are national policy actions needed to enhance CDM project development.

Multi-layered land tenure policy arrangements in Cameroon could inhibit carbon forestry development. The current proposed land use framework (*plan de zonage*) gives room for negotiation at the local level, but the lack of technical capacity and resources has hampered its implementation. Leaving room for conflict with local tenure arrangements. Conflicts of this nature will endanger the success of carbon forestry projects. FERN (2000) point to the role of land conflicts in carbon project failure in East Africa. Encouraging an integrated land use planning approach could help mitigate the problem while enabling the achievement of sustainable development and leakage avoidance.

Table 2.3 The likelihood of policy instrument application for CDM criteria in Cameroon under CIT

CDM Criteria	National Policy issue / Question	Policy Instrument	Mi	Mt	I+	Pi	Process Prediction	Observations
Institutional Development	Designated National Authority	DNA	-	-	-	-	Cooperation	Comité National MDP Cameroun
		Sub-Directorate of Community Forestry	+	_	+	0/+	Cooperation	Operating very well, could provide valuable experience for CDM project approval procedures
		Role of NGOs	+	+	+	+	Cooperation (Active)	Very good potential and interest; need capacity building and resources
		Overseas Development Assistance	+	+	+	+	Cooperation (Active)	Worked well for community forestry but Potentially limiting for forest eligibility
Eligibility	Definition of Forest		-	-	-	-	None	Not adequate
	Definition of low-income communities or individuals		-	-	-	-	None	None
Additionality	Land and resource tenure rights	ILUF (Plan de zonage)	0	+	0	+	Learning toward cooperation	Inadequate; needs an integrated approach to be helpful for CDM
		Forest and Tree resource entitlements (Section 9 (1-2) of 1994 Forestry Law)	0	0/+	0/+	+	Obstruction / None	Needs clarification and equity measures
	Forest Resource Risk Management	Fire management provisions	+	+	0/-	+	Cooperation	Good at community level; government needs resources
Acceptability	Sustainable Development Criteria and Indicators		-	-	-	-	Cooperation	See Annex 1 Decision 00008/MINEP/CAB
		Financial / taxation	+	_	_	_	None / Obstruction	Needs revision, otherwise would be counterproductive
	Regulations governing GMOs and potential invasive species in forestry		_	_	_	_	None	None
Externalities	Impact Assessment Regulations		0	+	0/+	_	Learning toward cooperation	Scanty and inadequate, needs development
Validation	Project review and approval procedure	UNFCCC Focal Point	+	_	+	0/+	Cooperation	See Annex 2 of Decision 00008/MINEP/CAB

NB: Mi – Motivated Implementers; Mt - Motivated Target group; I+ - Information for Implementation; Pi - Balance of power viewed from position of implementer; N / E– No evidence

Lastly, procedures for the acquisition of community forests must be simplified and meaningful support provided by policy implementation to curb the illegal logging induced by changes in financial and regulatory instruments in the 1994 law. This argument lends support to the ongoing revision of the manual of procedures and norms for community forest management.

Understanding the various indications of motivation, power and information of actors as they affect the above-mentioned constraining factors is relevant (see table 2.3). Perhaps a national strategy study in the nature of what preceded policy development in Indonesia, India or Morocco is also needed to understand the details of these issues.

2.6.2 Supportive Policy Dimensions / Opportunities

A number of opportunities for enhancing biosphere carbon sequestration exist in current policy including: the potential to fund capacity building activities through the national Special Forestry Development Fund; learning from the current regulatory framework for community forestry approval; and taking advantage of the current interest and capacity of Non-Governmental Organisations.

Government resources are in short supply and few opportunities exist for communities to obtain funds to develop projects. When overseas development assistance has funded the development of community forests this may render projects ineligible for the CDM under the financial additionality requirement. This means other funds are needed for capacity building and for start-up investments in communities. The Special Forestry Development Fund provides an own funding opportunity. This is a fund in the Ministry of Forests and Fauna that allows for percentage of forestry taxes to be reinvested into forestry development. Subak (2000) demonstrated that Costa Rica's own funding from hydrocarbon taxes was instrumental in developing the carbon forestry programme.

Current community forestry project approval regulations provide a good point of departure for CDM project approval procedure. They address and handle participation, planning, tenure, and conflict issues with some success (Brown et al., 2001), enabling some kind of good governance dimension to forest management in Cameroon (Brown et al., 2003). Over time, communities have gained experience with forest inventories, management plan development, monitoring and other relevant management mechanisms. These experiences further boost the potential for terrestrial carbon management within community forests. Carbon funds can provide the strong competition needed to stem the invasion of community forests by timber companies.

Better involvement of NGOs could help enhance carbon project uptake and implementation in Cameroon. Besides the initial interest seen from the Cameroon Mountain Conservation Foundation and the World Agroforestry Centre in carbon forestry studies in Cameroon, NGOs in the country have made remarkable contributions in terms of promoting sustainable forestry and forest policy (Ekoko, 2000). Table 2.3 also indicates a strong likelihood for implementation with NGO involvement given better resources; lobby strength, information, motivation, and the confidence the population have in them. Michealowa (2003) shows the very important role NGOs played in the development of relevant CDM policy in Indonesia and India. Institutional synergy and cooperation at multiple levels involving multiple actors enabled the development of carbon forestry in countries such as Costa Rica and Mexico (Subak, 2000; Nelson and de Jong, 2003). Specific policy attention must be given to institutional development.

In all, this study provides evidence that if national policy is to support CDM project development it must be addressed in a holistic manner, thus confirming the following IPCC report statement

"The public policy environment for agriculture, forestry, and industrial sectors varies across countries and may facilitate or inhibit the penetration rate of LULUCF projects. Such policies could address tax incentives, or subsidies for afforestation, reforestation or deforestation; land conversion to agriculture or alternative agricultural practices; land tenure; agrarian reform; and sustainable development more generally …" (IPCC, 2000 pg 303).

2.7 Conclusion

This paper set out to examine the compatibility between forest policy provisions in Cameroon and the CDM/Kyoto Protocol framework. It examined the relevant national policy questions within CDM project requirements, and then analysed specific constraining factors and opportunities for CDM forestry project development within community forestry policy.

Based on the foregoing analysis, we conclude that national policy in Cameroon needs to address the following to enable the uptake, development and smooth implementation of CDM projects. It must specify the following:

- A definition of forest;
- National impact assessment criteria and procedures;
- Criteria for low-income individuals or communities to qualify for small-scale CDM projects; and
- Genetically modified organisms and invasive species policy guidelines for project assessment.

Given that current eligibility criteria do not offer easy opportunities to maximise carbon sequestration potential for biosphere carbon management, it must recognise the need for the adoption of *pro-active policy action.* This would mean a holistic approach in which it must do the following: clarify ownership and entitlements to earnings from LULUCF services; facilitate review and approval procedures for forest types; enhance integrated land use planning within forest types to reduce conflicts and the potentials for leakage; and generate own start-up funds for policy development. Enhancing cooperation between NGOs, government agencies and research institutions will be vital for providing project level support and capacity building on complex novel issues such as additionality, leakage and development impact amongst others. Government could also consider facilitating the development of a national carbon market mechanism that would organise producers and link with the international carbon market. These measures would help national policy look beyond the current CDM rules and into the non-compliance market and post 2012 Kyoto scenarios in a bid to maximise options.

At the global level, the CDM /Kyoto framework needs to explore possibilities of setting-up mechanisms for supporting proactive biosphere carbon management policies in non-annex 1 countries at national level as well as in project development at the community level in order to enhance carbon forestry project adoption. This could be under the current rules or within ongoing negotiations on the carbon forestry rules beyond 2012.

In addition, the findings of this study also support the current considerations for reduced emissions through deforestation and degradation within the Kyoto Protocol process (post 2012). This is due to the fact that conservation activities that avoid emissions through deforestation in humid tropical countries like Cameroon are not eligible for the CDM even though deforestation causes about 25 % of global emissions. One of the widely supported post 2012 ideas is the concept of "compensated reduction". "Compensated Reduction" suggests a mechanism in which countries that elect to reduce national level deforestation to below 1980-1990 level would receive post facto compensation, whilst they commit to stabilise or further reduce deforestation in the future (Santili et al., 2005). Such a proposition offers better opportunities for forest management in the humid tropics like Cameroon. But it might mean that national governments take responsibility for meeting the reduction targets through a sectoral approach once they elect to participate in the compensated reduction scheme. The implications could be greater challenges for proactive forestry policy development and implementation especially because the rules are still being crafted. Hence, further research and learning will be needed.

Chapter 3

A data support infrastructure for Clean Development Mechanism forestry implementation: an inventory perspective from Cameroon[*]

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Abstract

Clean Development Mechanism (CDM) forestry project development requires highly multi-disciplinary and multiple-source information that can be complex, cumbersome and costly to acquire. Yet developing countries in which CDM projects are created and implemented are often data poor environments and unable to meet such complex information requirements. Using Cameroon as an example, the present paper explores the structure of an enabling host country data support infrastructure for CDM forestry implementation, and also assesses the supply potential of current forestry information. Results include a conceptual data model of CDM project data needs; the list of meso and macro level data and information requirements (Demand analysis); and an inventory of relevant data available in Cameroon (Supply analysis). From a comparison of demand and supply, we confirm that data availability and the relevant infrastructure for data or information generation is inadequate for supporting carbon forestry at the micro, meso and macro levels in Cameroon. The results suggest that current CDM afforestation and reforestation information demands are almost impenetrable for local communities in host countries and pose a number of cross-scale barriers to project adoption. More importantly, we identify proactive regulatory, institutional and capacity building policy strategies for forest data management improvements that could enhance biosphere carbon management uptake in poor countries. CDM forestry information research needs are also highlighted.

Keywords: Cameroon, Clean Development Mechanism, Data Infrastructure, and Land Use Land Use Change and Forestry, and Cameroon

3.1 Introduction

The Clean Development Mechanism (CDM) is one of the "flexible mechanisms" in the Kyoto Protocol designed to accomplish the objectives of the United Nations Framework Convention for Climate Change- (UNFCCC). CDM makes provision for investment by industrialised countries and industry in carbon emissions reduction and carbon sequestration projects in developing countries. These projects should contribute to sustainable development in developing countries (Non-Annex 1) while enabling developed countries (Annex 1) to meet emission limitation targets. One way in which sustainable development might be achieved could be through forestry projects, which are managed by and for rural communities, where they would contribute to local environmental values as well as income.

Land Use, Land Use Change and Forestry – (LULUCF) projects must meet certain conditions in order to acquire Certified Emission Reductions (CERs). CERs represent the emission reduction outputs of projects and constitute the basis on which payments are made. Projects must fulfil specific criteria in order to be issued CERs, including eligibility, additionality, and acceptability in terms of environmental and social impacts, sustainable development, and leakage. Fulfilment of these requirements implies the provision of reliable, documented and archived evidence demonstrating adherence to these criteria. A close examination of CDM information requirements reveal a fuzzy, highly multi-disciplinary and multiple-source mix which can be very complex, cumbersome and costly to acquire (Pfaff et al., 2000). Yet developing countries in which these projects are created and implemented are known to be data poor environments in very many domains (Dalal-Clayton et al., 2003).

Such data / information scarcity and unreliability in developing countries inhibit the abilities for community uptake and implementation of CDM forestry projects, thereby excluding poor communities from payments for environmental services and envisaged sustainable development benefits. More specifically, information scarcity could limit the scope for bottom-up estimates of carbon balance for forestry options (Conant and Paustian, 2004). Yet little attention has been given to enhancing host country and project level information management.

The objectives of this paper are three fold. First, it explores and underlines the need for an enabling data infrastructure for terrestrial carbon mitigation projects. Secondly, it reviews land use and forestry information available at the micro, meso and macro levels in the context of community forestry in Cameroon, as an example of a potential CDM host country, and considers potential sources and ways of enhancing information management for CDM project uptake and management. Finally, it looks briefly at the new developments as regards forest policy under UNFCCC Reduced Emissions from Deforestation and Degradation, (REDD), and considers what implications this would have for the data infrastructure.

Data / Information infrastructure is defined as the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to data relevant for the implementation of the CDM. It could include a set of structured or semi-structured data collected and stored in a proprietary format (data collection) and also, a formalised set of properties that describe with significant amount of detail the characteristics of the contents of a data collection (metadata) (Morales, 2004). Such an infrastructure provides the basis for the discovery, evaluation and application of data and information, potentially enabling reduced data collection time and cost, duplication, and greater access. “Data” are those facts about the world which an organization or individual appreciates as being meaningful to their concern; while “information” is data which may have been processed, and that is appreciated as useful within a particular decision-making process (Lewis, 1994).

3.2 Methods and Context

3.2.1 Methods

This study borrows principally from information and planning science methods. We use Grounded Theory in the analysis of information systems as described in Urquhart, (2001) and Strauss and Corbin, (1990). The method utilises an analytic process by which concepts are identified and developed in terms of their properties. We categorized, coded, compared and related CDM information requirements from policy documents and commentary in literature. The result in this case is a conceptual data model in the form of an integrative diagram representing the CDM data needs (Demand analysis). Similar methods are employed to determine the availability of such relevant data in Cameroon (Supply analysis).

To structure the analysis of the data supply infrastructure in a useful way, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis (Weihrich 1982; van der Blonk, 2003) was made. In this instance, we categorised, coded, compared and related information from interview transcripts, field observation / office data inventory notes and secondary data. The results also include a set of possible strategies for data and information supply enhancement needed to enable CDM forestry project uptake and implementation.

These methods are applied to two case studies of community forestry at the micro level and to government represented by the Ministry of Forests and Fauna at the regional (provincial) and the national level (meso and macro respectively). Given the very hierarchical and centralised nature of the government and governance in Cameroon, we have chosen to deal with both the meso and macro levels as one. The two communities studied at the micro level are Tinto and Bimbia Bonadikombo, in the southwest province of the country.

Cameroon has not as yet submitted any community forestry projects under the CDM. The two case studies represent typical community forestry projects with typical levels of data availability, which could potentially be submitted as CDMs. These cases thus give a good idea of what sorts of data demands can be met at present, and what would further be required. Learning from their experiences with data for community forestry purposes sheds light on what the likely information management problems and opportunities would be for carbon forestry.

3.2.2 The Micro Level Study Context: Local Community Forest Initiatives

3.2.2.1 The Tinto Community

The Tinto community consists of three neighbouring villages of the same clan namely Tinto Bessinghe, Tinto Kerieh and Tinto Mbu, in descending order of size. The total population is estimated at 1700 with less than 1% of the population being non-native. Tinto is rural but has the status of a sub-divisional (sub-district) headquarters. Inhabitants are mostly farmers, often combining farming with forest extraction activities.

The community signed a management agreement with government on a 1295 ha evergreen humid forest in December 2002, after receiving some technical assistance and financial support from a non-governmental organisation (NGO), Living Earth Foundation. The Tinto Clan Community Forest Common Initiative Group and a forest manager run the forest on behalf of the community. Few activities written into the management plan have been implemented. Lack of funds, the remoteness of the community and leadership inadequacies have been advanced among the reasons for this inertia

3.2.2.2 The Bimbia Bonadikombo community

The Bimbia Bonadikombo community is partly peri-urban in character and located on the fringes of the Limbe (Victoria) urban community. Limbe and the surrounding areas have a population of about 123,900 inhabitants. It is highly heterogeneous with few local people (of the Bakweri tribe), making the social and cultural environment intricate. It is a complex of many villages and several plantation worker camps.

The community has been managing a 3700 ha forest since mid 2002, with some technical support from the Mount Cameroon Project, which assisted particularly in preparing a forest inventory. The Bimbia Bonadikombo Natural Resource Management Council manages the forest. An executive board runs its activities while a forest manager is in charge of day-to-day management. There are 10 volunteers and three permanent staff working within this organisation. They get income mainly from access fees, fines from defaulters and auction sales.

3.2.3 The Macro and Meso Study Context (Forest/Land Use Administration)

The Ministry of Forests and Fauna steers forest policy implementation, including coordination with allied ministries. Based in the capital city, it has provincial and divisional delegations and sub-divisional forestry and wildlife posts in descending administrative order. A Directorate of Inventories holds major responsibility in information management within the ministry. This responsibility is shared with the Agence Nationale D'Appui au Développement Forestier (ANAFOR), a government agency that retains quasi-monopoly in technical services such as forest inventories, mapping and silvicultural services for the ministry. Within it is another sub-structure specialised in mapping and remote sensing known as Centre de Télédétection et de Cartographie Forestière (CETELCAF). The Système Informatique de Gestion des Informations Forestière (SIGIF) of CETELCAF constitutes the main computerised information system. All of these systems were set up without the CDM in mind.

Forest administration services at the provincial, divisional and sub-divisional levels are basically involved in routine narrative reporting on the state of forests in their jurisdiction. Occasionally sketch/traced maps of concessions, protected areas and production forest areas are included in these reports. Inventories and management plans for these forest units constitute the main sources of detailed information on botany, forest characteristics and land use changes.

3.3 CDM forestry project data requirements (demand analysis)

This section gives an overview of the evidence (data and information) required of the CDM process for forestry projects. Figure 3.1 summarises the CDM project cycle. It shows the links between the project on the ground (micro level), the national level (macro) and the international institutions that verify and certify the projects. This implies information has to be carefully managed between the institutions in the right formats within the CDM process. However, we begin by briefly sketching the CDM forestry project requirements.

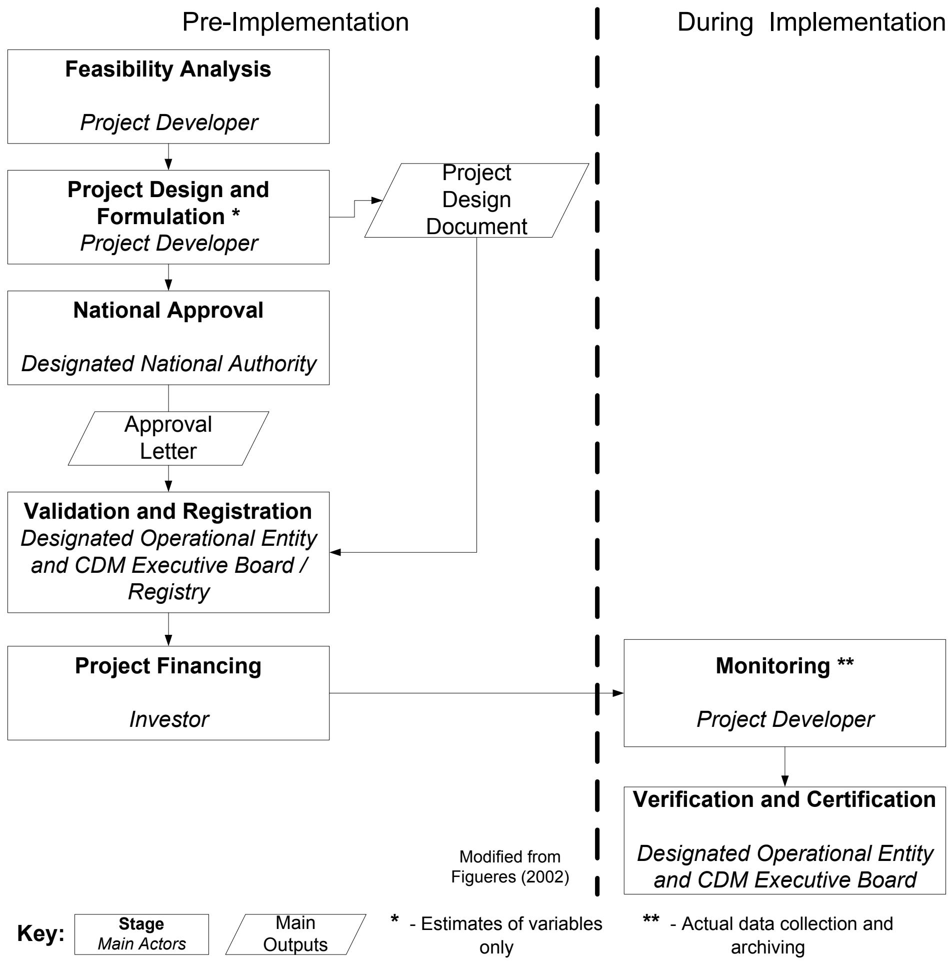

Figure 3.1 Clean Development Mechanism Project Cycle

3.3.1 CDM Forestry Requirements

CDM projects are expected to meet a set of requirements prior to the issuance of certified emission reductions. These requirements are articulated in the Kyoto Protocol and in subsequent decisions taken during various Conferences and Meetings of Parties (Decisions 19/CP.9 and 14/CP.10). These requirements can be summarised under the following categories: eligibility, additionality, acceptability, externalities and certification.

3.3.1.1 Eligibility

Afforestation and Reforestation are the only forestry activities eligible under the current CDM rules during the first commitment period (2008-2012). Afforestation would mean planting trees on land that has not been forest for a period of at least 50 years (i.e. according to the host country definition of forest). Reforestation would mean planting trees on land that was not forest on 31 December 1989.

3.3.1.2 Additionality

Sequestration or emission reductions due to the project activities must be "additional" to any that would occur in the absence of the project (Paragraphs 18-22 of Decision 19/CP.9). In other words, holding everything else constant, would a project have happened in the absence of the offset crediting system? If yes, then the project is not additional; if no, then the project is additional (Trexler et al., 2006).

3.3.1.3 Acceptability

The Kyoto Protocol states that all carbon offset projects in developing countries are required to contribute to sustainable development (Article 2.1 and 12.2). Host countries have to set criteria for sustainable development by which projects will be judged.

3.3.1.4 Externalities (Environmental Impact and Leakage)

Projects must demonstrate a clear strategy to deal with all socio-economic, cultural and environmental impacts that may arise from project implementation. Projects have to demonstrate how the negative impacts would be mitigated or countered. Project analysis must also show how they will address possible unplanned emissions that could occur outside project boundaries as a result of project activities (known as leakage).

3.3.1.5 Certification

The concreteness, measurability and long-term characteristics of the project will have to be checked independently by a third-party (i.e. a Designated Operational Entity) accredited by the CDM executive board. This takes place in two stages namely validation and verification (see figure 3.1). These processes enable project registration, and the issuance of Certified Emissions Reductions, for offset credits respectively.

3.3.2 Alternative Non-CDM Approaches

Current ideas under discussion by UNFCCC regarding post-2012 Kyoto Protocol implementation suggest that a national, sectoral approach to forestry might be adopted, such as the concept of "Reduced Emissions from Deforestation and Degradation- REDD" which proposes the introduction of natural forest management into the Kyoto options (Santili et al., 2005). The REDD idea suggests a mechanism in which countries that elect to reduce national level deforestation to below 1980-1990 level would receive post facto compensation, whilst they commit themselves to stabilise or further reduce deforestation in the future. This means national governments taking responsibility for meeting the reduction targets through a sectoral approach. The details as regards data requirements for this type of approach are not yet clear, since indeed the policy is only at the discussion stage, but it is clear that such an approach cannot be taken without rigorous planning and monitoring data; and since the approach is nation-wide rather than at project level, it is self-evident that an appropriate national information infrastructure will be needed as soon as a country elects to be part of this mechanism. The implications of this are taken up in chapter 3.5.2.2.

3.3.3 Micro-Level Information

Project developers have to provide verifiable evidence demonstrating adherence to all of the above-mentioned CDM rules in a Project Design Document (PDD). Appendix A of Decision 19/CP.9 specifies the content of the project design document for Afforestation and Reforestation projects, while appendix A of Decision 14/CP.10 details simplified procedures for "small-scale projects" – i.e. producing <8 Kt CO_2/yr.

Figure 3.2 represents a conceptual data model for CDM information management at the micro (project) level. It identifies the various data units needed and shows how they could contribute to the arguments for various criteria in the project design document. We derived the model from analysing the details written into various Kyoto/CDM decisions and publications (IPCC, 2003; Decisions 19/CP.9; Decision 14/CP.10). Information from approved methodologies such as methodology number AR-AM0001 for "reforestation of degraded land" in Guangxi, China and an analysis of methodologies reviewed within the CDM procedure so far by Kagi and Schoene, (2005) are also used in the analysis.

The specifics of data and choices of what data to employ in arguments would depend on each project and its chosen methodology. For instance, a project can choose which of the five carbon pools they want to account for, hence some of the information in column 3 of figure 2 will not be relevant. Most projects have opted for above-ground tree biomass and below-ground biomass leaving soil, dead wood and litter optional. However, projects have to demonstrate that the excluded pool will not influence net carbon removal or increase as part of the baseline or project activity. This means they still require limited data for these pools to enable argumentation.

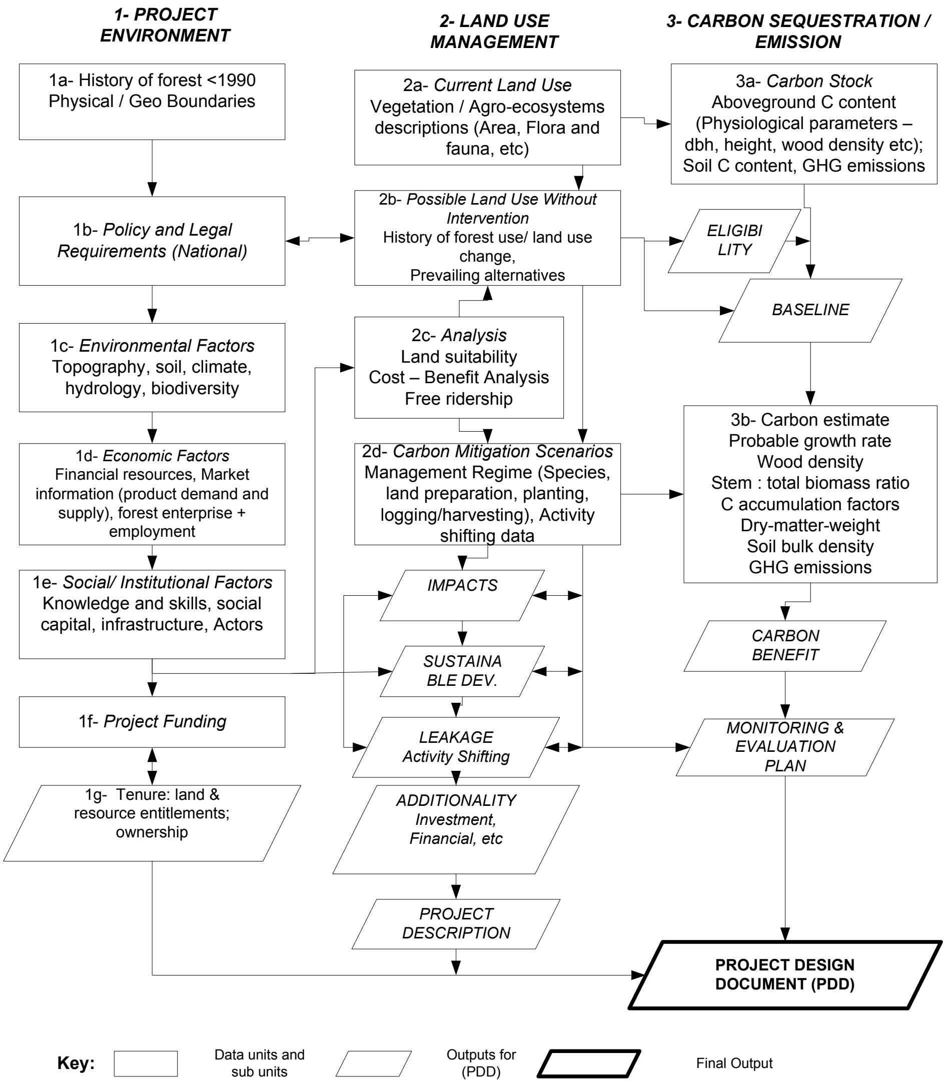

Figure 3.2 Conceptual data model for CDM PDD preparation

Looking at the categories of data displayed in Figure 3.2, it is clear that a large proportion requires local level data (e.g. 1 a, c, d, e, g; 2a,b; and 3a and possibly 3b). For although most methods in the Good Practice Guidance argue for a combination of default values, field measurements and model-based methods (IPCC, 2003), the purpose and level of activity might influence the kind of data used. Project feasibility studies at an early stage may rely on default values and regional land use data for some steps, e.g. to determine whether the project qualifies as a small scale project or not, but for many other steps local data are essential. Field measurements are in any case compulsory for monitoring normal and small-scale projects.

Murthy et al., (2006) found that costs of gathering such data would vary depending on the methodology used (there are four approved afforestation and reforestation methodologies and normal sized projects may also propose their own). For a 32,965 ha community forest project in India, they report costs of $1.2 /t C if default values are used; $2.8/Mg C when modelling is used; and $7.0/t C when cross-sectional field studies are employed.

3.3.4 National (Macro) and Sub National (Meso) Levels

Macro and meso level data are not mandatory for CDM project development but can be supportive of carbon forestry project uptake and implementation. Current modalities and procedures stipulate two compulsory data types for project validation at national level, including criteria for the determination of sustainable development, and poverty criteria for community qualification for small-scale projects (Decision 19/CP.9).

The Good Practice Guidance report (IPCC 2003) provides three levels or 'tiers' as regards use of data. Tier 1 methods involve standard categories using default values based on IPCC factors stratified on a regional basis (temperate and tropical), while Tier 2 involves using more country-specific categories and carbon sequestration rates as opposed to those advanced by the Kyoto framework. Tier 3 involves model-based estimates requiring much more detailed data on the ground activity and other data. Country level data would include area-specific land use data and categories and allometric equations for specific agro-ecosystems and soil bulk density indices that may be beyond the expertise of project developers (Birdsey, 2004; Brown, 2002; Conant and Paustian, 2004).

Some project experiences show that meso level or national level data can be helpful for feasibility analysis and for estimating project baselines using tier 2 methods. For example, Murthy et al., (2006) used regional default data in estimating carbon project baselines in the Mancherial forest division in Andhra Pradesh, India. However, they also note that they could have obtained better results if regional land use records and afforestation trend data of the area were up to date and well organised.

The nature of leakage constitutes another important reason for macro and meso data generation support (Chomitz, 2002; Tipper et al., 2002). Projects would have physical boundaries beyond which monitoring would be impracticable, hence would need regional and national data on land use activity shifts and market dynamics (forest product demand and supply) to support leakage monitoring.

3.4 Supply Analysis

In this section we firstly examine data availability using a simple checklist approach. Checklists include data types in figure 3.2 for the micro level and column 1 of table 3.2 for meso and macro levels. Secondly, we discuss the entire information infrastructure capability in terms of Strengths, Weaknesses, Opportunities and Threats.

3.4.1 Data Availability

3.4.1.1 Micro level data availability

Table 3.1 summarises data availability in the two case study communities. The available information in these communities is routinely collected as part of the community forests planning process (i.e. aspects of 1a, c, d, e, g; 2a; and 3a in figure 3.2). Some of this information could be used for further analysis on impact, baselines, leakage and other CDM requirements. Additional information would be needed to plan for carbon management. For example, community forest inventories were done mainly for timber species and for trees of diameter >30cm. Carbon measurements would require multi strata data and also height and dry weight measurements in sub-plots for all species. Land use change information is also not available, but land tenure information is available as oral narratives.

Both communities have a limited amount of available data in digital format. More digital information is available from Bimbia, but mostly in the keeping of the Mount Cameroon Biodiversity and Conservation Centre. The Centre inherited digital geographic data of the boundaries, biological inventories and land use data of Bimbia from Mount Cameroon project and retains them to date. The community needs to apply to the Conservator of the Centre to have access to the data. For carbon forestry to work, this information would have to be kept and updated regularly by the community and also shared with the institution responsible for verifying carbon changes.

The quality of data available in both communities is good. The facilitating non-governmental organisations ensured good quality expertise, planning and quality control during the data collection and analysis process. Experts from the

Sub-Directorate of Community Forestry in the Ministry of Forests and Fauna validated the forest inventory process and inventory results of both communities.

Table 3.1 CDM Micro level data availability for Tinto and Bimbia Bonadikombo

Data Type	***Tinto***			***Bimbia Bonadikombo***		
	Paper data	**Digital data**	**Comments**	**Paper data**	**Digital data**	**Comments**
1 Project Circumstances						
History of forest <1990	P	P	Not documented	P	P	Satellite images and maps available from MCBCC[a] GIS lab at a fee
Physical and Geo Boundaries	Y	N		Y	Y	
Current land/ resource ownership and entitlements	Y	N	Partial	Y	N	Partial
Environmental factors Topography, soil, climate, hydrology,	Y	N		Y	N	Accessible in MCBCC by application
Biodiversity	P	P	Ibid	Y	Y	Accessible at MCBCC by application
Financial resources	Y	N		Y	Y	
Product demand & supply	Y	N	Incomplete	N	N	
Forest related employment	N	N		N	N	
Social / Institutional factors	Y	N		Y	N	
Knowledge and skills	N	N		N	N	
Stakeholder description	Y	N		Y	Y	
2 Land Use Management						
Current land use	Y	N		Y	N	
History of land use change	P	P		Y	Y	From MCBCC
Land Suitability	P	P	Only indigenous Knowledge	P	P	Only indigenous knowledge
Deforestation	N	N		N	N	
Afforestation / Reforestation	N	N		P	P	Tree planting data
Records of cost and benefits of forest activities	Y	N	Only in part	Y	Y	
Free ridership tendencies	N	N		N	N	
3 Carbon sequestration / Emission						
3a Soil C content	N	N		N	N	
Above ground C Diameter, dry weight, etc	P	P	Was done only for valuable timber species of diameter mostly >30cm	P	P	Trema–database with measurements including trees < 30 cm obtainable from MCBCC (Partial)
Species inventories	N	N		Y	Y	
C accumulation factors	N	N		N	N	

[a] Mount Cameroon Botanic Gardens and Conservation Centre
Key: N = Not available; P = Partially available; Y = Available

3.4.1.2 Macro level data availability

Table 3.2 summarises the macro level availability of data in Cameroon that is required to support CDM project uptake and implementation. Relevant information is found in very many ministries, departments, government agencies and Non-Governmental Organisations (NGOs), but it is patchy, area-specific, project based and not the result of mainstream procedure of government data collection interventions.

Access rules vary between the meso and macro data items according to the institutional policies of each of the holders or producers of the data. For example, aerial photos and maps at the Institut National de Cartographie are paid for, while NGO projects such as Global Forest Watch would grant image data free of charge.

Data quality is also varied because different institutional values, sampling methods and purposes apply to data sets. Though common prescriptions for management inventories exist (ONADEF, 1992a, b, c), no common verification and validation procedures exist. For example, geographic / remotely sensed data and information at Centre de Télédétection et de Cartographie Forestière (CETELCAF), Ministry of Forests and Fauna (MINFOF), Global Forest Watch (GFW) and Institut National de Cartographie (INC) (Table 3.2) on land use, land cover and forests have different mathematical, thematic and attribute accuracy levels. The generally poor data availability in the LULUCF land use and forestry environment in Cameroon is the result of a multiplicity of factors. A detailed analysis of these factors across scales is given in the next section.

3.4.2 SWOT Analysis of Land Use and Forestry Information Infrastructure

Table 3.3 summarises the Strengths, Weaknesses, Opportunities and Threats (SWOT) for the forestry information infrastructure across the levels. It also proposes potential strategies for its enhancement. We elucidate on these dimensions in the ensuing paragraphs.

Table 3.2 CDM meso and macro (National) level information availability

Data Type	Paper data	Digital data	Department / Agency Involved	Ministry of	Comments
Criteria for determining poor communities	N	N	-	-	-
Indicators for Impact assessment	N	N	-	-	-
Indicators for Sustainable Development	Y	Y	'Comite Natonal MDP Cameroun' [a]	Environment and Nature Protection (MINEP)	Qualitative
Allometric equations for tree species	P	P	Agence National d' Appui au Développement Forestier (ANAFOR), World Agroforestry Centre (ICRAF)	Forests and Fauna (MINFOF)	Available for well known timber and agroforestry species
Soil bulk density index by region	N	N	-	-	Isolated site specific data
Carbon accumulation factors	Y	Y	Institut de Recherche pour L'Agriculture et le Développement– (IRAD), ICRAF	Scientific Research (MINRESI)	
Remote sensing data	Y	Y	Centre de Télédétection et de Cartographie Forestière (CETELCAF), Institut National de Cartographie (INC), Global Forest Watch (GFW)	MINFOF (Centre de Savoir); MINRESI	-Aerial photos of 1950 and 1991 for some forest areas at INC - Free satellite imagery for most of country at MINFOF
Forest Cover and Land use	P	P	CETELCAF, GFW	-	
Deforestation data	-	-	-	-	-
Afforestation	P	P	ANAFOR		Mainly tree planting data
Reforestation	N	N	-	-	-
Botanical data	P	P	Limbe Botanic Garden, National Herbarium	MINFOF; MINRESI	
Market information on forest products (Regional / National)	P	P	Centre for International Forestry Research (CIFOR)		

[a] The Designated National Authority for Cameroon

Key: N = Not available; P = Partially available; Y = Available

3.4.2.1 Strengths

Strong civil society contributions: Non-Governmental Organisations (NGOs) have greatly influenced the forestry information infrastructure in Cameroon at all levels. Most communities currently managing community forests including Tinto and Bimbia, have received technical and financial support from NGOs or bilateral conservation projects. The Tinto community received help from Living Earth Foundation between 1999 and 2003 while Bimbia received assistance from the Mount Cameroon Project between 1996 and 2004. In Tinto a 10% inventory was done as required by community forestry regulations alongside socio-economic studies and management planning. In Bimbia, Mount Cameroon Project did more, it developed a database of the Cameroon mountain forest area called Trema. It consists of geo-referenced forest inventory database with 20,000 data records from approximately 300 forest samples. It has built in functions to derive indices of 'bioquality' and can be easily modified using additional field information and regression equations to serve carbon management purposes (EcoSecurities, 2002). Table 2 also shows that a great deal of regional and national level information is available from NGOs. Experience in carbon project development in other developing countries has shown that NGO support with providing technical skills in data gathering is important for project uptake and development (Tipper et al., 2002).

Experience in community forest inventories: Developments in community forestry since 1994 have been helpful in improving information availability at the micro level. McCall and Minang (2005) show that communities improved their information systems, knowledge and skills significantly during community forestry planning. For example, the Tinto and Bimbia communities learned how to carry out participatory forest inventories because it is a sine qua non for community forestry in Cameroon. Such skills would be useful for carbon forestry monitoring in terms of reducing costs. Zahabu, (2006) shows that using community members (with minimal supervision) to carry out carbon inventory field measurements in Tanzania (at between $2-8 /ha/year) would reduce costs by between 70-50% compared to hiring professionals (at $15/ha/yr), and demonstrates that such community measurement can easily be carried out, delivering accurate estimates of carbon stock. The training and exposure to these measurement methods also helps the community understand the value of trees. This can motivate tree planting and hence provide a multiplier effect on carbon forestry. Further evidence of the abilities of communities to effectively manage data gathering on carbon stocks is presented by the Kyoto: Think Global, Act Local Project (www.communitycarbonforestry.org).

Table 3.3 Summary of SWOT analysis of forest information infrastructure in Cameroon

	Strengths (S) ●Community experience in forest management ●NGOs have strong potential to facilitate capacity building	**Weaknesses (W)** ●Poor quality control ●Inadequate technical capacity ●Inadequate material and financial resources ●Insufficient recognition of private information services ●Poor planning	
Opportunities (O) ●Emerging cost effective methods e.g. Participatory Mobile GIS ●Available online data ●Growing environmental services markets ●Own funding opportunity through the Special Forestry Development Fund	**(SO) Strategies** ►Involvement of NGOs, research organisations, and experts in training and capacity building ►Update policy to encourage wider environmental services development ►Mainstream relevant CDM data collection into forestry information systems	**(WO) Strategies** ►Improve local data quality by learning from online databases and resources ►Use Special Forestry Development Fund for capacity building ►Define procedures and standards for land use and forest data collection and management	**(OT) Strategies** ►Explore growing environmental services market to overcome logging industry and low carbon prices ►Develop potential of promising appropriate technologies and methods including Participatory-GIS
Threats (T) ●Competitive Logging sector ●Low carbon prices	**(ST) Strategies** ►Train Project Developers in effective cost efficient methods	**(WT) Strategies** ►Information, education and communication on potentials of environmental services market	
	(SW) Strategies ►Policy recognition of private information services ►Networking between communities and civil society to enhance learning and capacity building		

3.4.2.2 Weaknesses

Inadequate resources: Great lack of knowledge in data management is observed at all levels, and the poor financial resources at all levels impede access to trained resource persons, in-service training and material and technical resources.

Murthy et al., (2006) cite costs for establishing baselines and project formulation of $1.25 /ha/yr for a 32,965 ha community forestry project. These costs are expected to increase for much smaller forests. Zahabu (2006) cites actual carbon inventory costs from three small community forests in Tanzania ranging from $2.5 – 21/ha/yr. On the other hand, total incomes for the Tinto and Bimbia community forests for 2005 were $10150 (5 million CFA franc) and $30200 (15 Million CFA franc) respectively. The Bimbia community was running at a deficit of approximately $3000 at the end of the same period. Considering the above-mentioned costs and the financial resources of these communities, it may be difficult to begin CDM project development in these forests without outside help.

Technical resources such as satellite images, Global Positioning Systems (GPSs) and tree height measurement instruments would be helpful in providing information required for baseline estimation and eventual monitoring. Free satellite image data is obtainable from the Ministry of Forests but communities would need to hire expertise for analysis. Bimbia has one GPS that can allow them to map current land use, whereas Tinto has only a compass that can be useful for inventories.

The human resources required for related baseline analysis and monitoring are currently limited in both communities. 14 Bimbia and 11 Tinto community members received training from Living Earth and Mount Cameroon Project respectively on timber inventories during the process of developing the simple management plans. The main skills acquired included doing physiological measurements (tree heights, dbh), using the compass and or the GPS, tree identification and laying out sample plots and transects. But the skills required for carbon estimation are more complex, including biomass estimation, using allometric equations, root biomass estimation, destructive sampling, etc. These technical carbon estimation skills are absent in both communities.

Skills for financial and investment analysis are absent in these communities. One of the staff in Bimbia has basic undergraduate knowledge in cost-benefit analysis but this is not enough. The community needs to hire such services at high costs. In Tinto no one has the required skills and knowledge.

Besides the lack of knowledge and skills, there are shortages in staffing (skilled and unskilled) to enable adequate data collection at project level and within government institutions. In Bimbia for instance, the ratio of staff to forest area is 1: 285 ha. In Tinto, the ratio will be 1:120ha if the manager and the 11 trained persons are taken into account. In the Southwest Province where both communities are located, the ratio of Ministry of Forests and Fauna staff to forest area is about 1:15000 ha (Brunner and Ekoko, 2000). These resources are grossly inadequate to meet the high carbon forestry information demands.

Poor planning and coordination: Relevant forest and land use data collection, storage and distribution are extremely inadequate. No systematic data collection procedure with complete coverage of agro-ecological zones exists in the country. A good part of existing data is from conservation projects at specific sites, at varied times and with varied methods (see Table 3.2). The creation of the Système de Gestion D'informations Forestière at the Centre de Télédétection et de la Cartographies Forestière was a first attempt at coordination. But this system contained mainly boundary, limited inventory and harvest data from timber concession areas. An attempt at making a systematic nationwide mapping of agro-ecological zones came with the indicative land use framework (*Plan de Zonage*) in 1995. But this ended up covering slightly less than 30% of the country.

For data generation to be effective in serving wider sustainable development objectives including terrestrial carbon mitigation, it has to be systematic. To serve the development of default factors as well as Tier 3 methods, its spatial resolution must be planned to cover all five agro-ecological zones of Cameroon as well as internal variability within these zones (IPCC, 2003). Birdsey (2004) recommends a temporal resolution of five years in order to capture land use change and management impacts for carbon forestry.

To illustrate the difference between a systematic approach and that existing in Cameroon we sketch the United States Department of Agriculture (USDA) Forest Service, Forest Inventory and Analysis (FIA) program as described in Birdsey, (2004). They conduct a continuous inventory of forests, providing periodic estimates of area, timber volumes, tree biomass and wood products. Data are collected in many states every year, with all of the sample plots scheduled for measurement over a period of 5-10 years. A multiphase sampling design is used allowing for detailed ground measurements in about 150,000 permanent field locations. It might be costly for a non-annex 1 country to carry out such detailed and intensive ecosystem studies.

Inadequate recognition of private information initiative: Current practice does not encourage private initiative in information systems development. Data and information products from non-government sources are unlikely to be considered legitimate for various purposes even though they may be more up-to-date and accurate. For example, certified forest boundaries hand-traced on

1983 topographic map sheet cuttings by the Institut National de Cartographie although no field visits were used, in preference to recent community-produced Geographic Information System (GIS) maps, for the Tinto community forest application approval by the Minister of Forests and Fauna (McCall and Minang, 2005). Issues of this sort discourage information systems development and data collection at various levels, especially when large investments in time and money are involved.

Local non-governmental organisations and consultants argue that recognition of private information services in other land use and forestry activities would encourage investments that would benefit carbon forestry though they may not be worthwhile for carbon forestry alone.

3.4.2.3 Opportunities

Emerging cost effective methods: Participatory Geographic Information Systems, notably mobile Geographic Information Systems (GIS) based methods are proving to be simple, accurate enough and cheaper for community carbon measurements and monitoring in Senegal, Tanzania, Nepal and India. Experiments using hand-held computers with GIS capability and attached Geographic Positioning Systems (GPS), are enabling villagers with between 4-7 years of basic education to successfully map forests, measure and digitally enter biomass data (dbh, height, species name, etc) and relocate permanent sampling plots successfully after just 1-3 days of training (Skutsch, 2005; Verplanke, 2004). Carbon inventory costs were reduced by about 50% (compared to employing professionals) while rigorously respecting the methodological guidelines of the IPCC. Technologies of this type could be helpful in building on current community experience in Bimbia and Tinto where in the communities had been trained in the use of GPS devices, compasses and aerial photo interpretation. These methods enable simplification of the complex CDM rules at local level through basic training. It also enhances the utility of local knowledge and improves the acceptability and sharability of information within the CDM framework. Costs of these gadgets are falling very fast, thereby improving prospects for increased use in poor communities like Tinto and Bimbia.

Available online data: Chapter 3.4.1 indicates that remote sensing and GIS data for land use, forest cover is not adequately available and accessible for use by potential project developers in Cameroon. One way of mitigating this problem is through the use of open source databases. Satellite imagery and other geographic data can increasingly being accessed free of charge on the internet from databases. A relevant example includes online access to Multi-Spectral Scanner (MSS), Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM) satellite imagery and digital elevation models, at the Global Observation of Forest Cover (GOFC) Project website. While these sites may not provide all the information, they can greatly contribute both to carbon baselines establishment and monitoring data within the CDM and to reduced emissions from deforestation and degradation. As in the case of Bimbia, a non-governmental organisation or academic institution may have to play the role of facilitator, providing the technical skills and resources required to manage this data.

Budding environmental services markets: The potential growth of markets for other environmental services including watershed management and biodiversity offers great opportunities for the development and application of a multipurpose forest data infrastructure (Grieg-Gran et al., 2005; Pagiola et al., 2005). If integrated forest management including all services is adopted, key forest information could be used for carbon, biodiversity and watershed management and other ecological services and hence reduce the cost per unit of data collection and management. In aggregation, the potential revenue may provide sufficient motivation for investments into adequate data infrastructures that carbon alone would not justify.

3.4.2.4 Threats

Competitive logging sector and low carbon prices: Given lucrative timber market prices, logging has a competitive edge over carbon as a forest use, thereby impeding investments into carbon development including data collection and information management. Tommich et al., (2002) suggest a world price of $25 per tC to shift incentives from forest conversion (including logging) to conservation in Indonesia, whilst current CDM prices are only between $ 3-5/t C.

3.4.2.5 Strategies

Observations emerging from the above analysis point to a number of potential strategies (see table 3.3). Salient proactive policy strategic issues in table 3.3 such as capacity building through training, promoting networking and institutional development; and embracing hi-tech, the internet and the market mechanisms driving the commoditisation of environmental services are sketched in the conclusions.

3.5 Conclusions

International policy information specifications for certification or environmental service payments under the CDM cannot easily be met in data scarce environments, thereby limiting the participation of many developing countries in such schemes. This paper firstly examined the need for, and explored the structure of, a supportive data infrastructure needed for CDM implementation

(Demand). Next, it reviewed the appropriateness of current forestry data infrastructures in Cameroon to supply the required information.

We confirm that data demands for CDM projects far exceed the supply capacity of communities at the micro, meso and macro levels (see Tables 3.1 and 3.2). This is also true for small-scale project conditions, implying that current slow trends in CDM project uptake and development are likely to continue if information demands are not revised at the international level. Nevertheless, table 3.3 presents a summary of the strengths, weaknesses, opportunities, and threats to the development of an enabling CDM implementation data supply infrastructure. More importantly it presents a set of potential strategies that would be required to support CDM project uptake and implementation. They can be grouped into a number of general categories of required practical policy implications.

3.5.1 Direct Measures for Enhancing Data Infrastructure for CDM

Firstly, engaging in micro (project) level capacity building is urgent if carbon forestry project uptake is to be improved in Cameroon. Such a programme must actively target training in good practice carbon data gathering techniques and monitoring methodologies as described in the Good Practice Guidance Report (IPCC, 2003), as well as growing and emergent approaches such as the participatory GIS being applied in Tanzania, Nepal and Senegal (Skutsch, 2005; Verplanke, 2004). Helping with the acquisition of the appropriate data collection technology could also be included in such a scheme. One way of achieving this would be to develop a number of "centres of excellence" or networks of expertise that can systematically provide training nationwide to aspiring project developers.

Another option could be to actively engage interested Non-Governmental Organisations (NGOs), academic institutions and consultants to partner with project developers and provide such training and capacity building. This approach has been helpful in carbon project development in other developing countries- for example, the Scolel Te project in Mexico was supported by Ambio and the Edinburgh Centre for Carbon Management (Corbera, 2005); Mount Elgon and Kibale National Parks reforestation projects in Uganda received Face Foundation support (Jindal et al., 2006); and the Centre for Ecological Sciences in Bangalore is providing leadership in supporting CDM forestry projects with local partners in several places in India (e.g. Murthy et al., 2006). The strategic role played by NGOs in community forestry uptake following similar capacity concerns with the community forest acquisition procedures also supports a greater role for NGOs in facilitating CDM forestry projects.

The "Comité National Mecanisme de Developpement Propre (MDP) Cameroun", Cameroon's Designated National Authority that has the mandate to promote project uptake, could solicit funding for such a capacity building programme from the Special Forestry Development Fund in the Ministry of Forestry and Fauna. This special fund is an initiative that enables a proportion of forest revenues to be ploughed back into forestry development. The example of a national forestry financing fund called FONAFIFO in Costa Rica (Subak, 2000), which helped initiate local carbon management projects within agroforests, remain one of the best examples of how government funds can be used to motivate project uptake and implementation. They could also tap from multilateral Kyoto capacity building funds. Examples include the Capacity Development for Clean Development Mechanism at the UNEP Collaborating Centre on Energy and Environment and UNIDO's CDM Capacity Building for Francophone African countries.

Secondly, enhancing meso and macro level data infrastructure would complement micro level CDM land use, forest cover and leakage data. Necessary changes could include developing standard procedures and norms for forest data collection at all levels for various forest types, including the recognition of the role of private sector in the process. Such a standard could tap from the rich International Standards Organisation (ISO) literature (e.g. the 8000, 9000 and 19000 series) and from the experiences of timber certification (Molnar, 2004)

Clearly defining roles and responsibilities for planning and coordination in agriculture, forestry and land use information management following well developed examples such as the United States Department of Agriculture Forest Inventory and Analysis program (Birdsey, 2004) would also be important

3.5.2 General Implications

3.5.2.1 As regards CDM

Firstly, more attention should be given to supporting an enabling national policy framework, especially the development of an enabling data support infrastructure. Our study shows that the absence of an enabling data support infrastructure constitutes a significant impediment for CDM project uptake in poor countries, especially in Africa where the uptake and development of CDM projects is slowest (Jindal et al., 2006). It shows that national level data such as land use, soil bulk density or allometric equations and more will be required as they are beyond the skills of most project developers, and are needed to support the Tier 2 methods as required in the Good Practice Guidance for Land Use, Land Use Change Forestry projects (IPCC, 2003).

Secondly, research into new, effective and appropriate methods for planning and monitoring CDM forestry projects, such as mobile GIS, participatory inventory techniques and cost effective remote sensing techniques are required to speed up project uptake and implementation in host countries. This would also mean reinforcing technology transfer mechanisms within CDM implementation processes. This needs to be built into the global CDM capacity building strategy if project implementation is to go ahead in poor countries like Cameroon that are currently lagging behind.

Finally, this study suggests that current CDM afforestation and reforestation information demands as currently designated are almost impenetrable for local communities and also present a number of cross-scale barriers to project adoption. Moreover, it demonstrates that proactive capacity building and data support infrastructure policy development are needed in developing countries as a route to enhancing project uptake.

3.5.2.2 As regards future forest policy options under UNFCCC

As noted in chapter 3.3.2, it is possible that CDM policy regarding forestry in developing countries may be supplemented, or even superceded, in the post-2012 period by an approach in which the whole forest sector, or even the whole land use sector, of a country is treated as a unit. The main advantage of this policy shift is that it would greatly widen the scope of investments in forestry to contribute to mitigation of climate change, since not only afforestation and reforestation, but also forest management and efforts to reduce rates of deforestation could be included. But such an approach brings with it massive requirements for data; border to border, continuously monitored forest inventory information would be needed so that the country could weigh forest gains in some areas against losses in others, since only the absolute gains in forest would be rewarded. Skutsch et al., (2006) point to the heavy reliance on remote sensing data for implementing Reduced Emissions from Deforestation and Degradation (REDD) in this regard. This would include serial remote sensing images from a given base period / year, land use, land cover, forest area and texture changes and ground truth data for all these categories. Thus, if REDD is adopted, meso and macro level data would become an absolute necessity for carbon forestry implementation in non-Annex 1 countries, to a much greater extent than is now the case for CDM, for which at present meso and macro level data is seen as merely supportive.

In addition, highly detailed, systematically collected micro-data is likely to be needed, for validating remotely sensed estimates of degradation and to some extent deforestation (i.e. as ground truth) within the REDD framework in the future. Moreover, if any sort of internal reward system is to be developed, micro-level data will be needed so that incentives can be provided for the various stakeholders who are responsible for the reductions in deforestation, through a payment for environmental services system for example (Trines et al., 2006). The participatory approaches to carbon stock assessment by communities themselves, which were developed in the first instance in the context of CDM, could here be of immense importance.

Chapter 4

Community Capacity for Implementing Clean Development Mechanism Projects Within Community Forests in Cameroon[*]

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Abstract

There is a growing assumption that payments for environmental services including carbon sequestration and greenhouse gas emission reduction provide an opportunity for poverty reduction and the enhancement of sustainable development within integrated natural resource management approaches. Yet in experiential terms community-based natural resource management implementation fall short of expectations in many cases. In this paper we investigate the asymmetry between community capacity and the Land Use Land Use Change Forestry (LULUCF) provisions of the Clean Development Mechanism within community forests in Cameroon. We use relevant aspects of the Clean Development Mechanism criteria and notions of "community capacity" to elucidate determinants of community capacity needed for CDM implementation within community forests. Main requirements are for community capacity to handle issues of additionality, acceptability, externalities, certification and community organisation. These community capacity requirements are further used to interpret empirically derived insights on two community forestry cases in Cameroon. While local variations were observed for capacity requirements in each case, community capacity was generally found to be insufficient for meaningful uptake and implementation of Clean Development Mechanism projects. Implications for understanding factors that could inhibit or enhance community capacity for project development are discussed. We also include recommendations for the wider Clean Development Mechanism / Kyoto capacity building framework.

Key words: Community Capacity; Clean Development Mechanism; Community Forests; Cameroon

4.1 Introduction

There is a growing assumption that payments for environmental services including carbon sequestration and greenhouse gas emission reduction could provide an opportunity for poverty reduction and the enhancement of sustainable development within integrated natural resource management approaches (Asquith et al., 2002; Pagiola et al., 2005). Studies have identified community forest management as a model that could meet the triple objectives of providing mechanisms and incentives for community management of carbon, forest conservation and local development needs (Klooster and Masera, 2000; Poffenberger et al., 2002; Smith and Scherr, 2003). Yet community-based natural resource management performance remain mixed (Agrawal, 2001; Armitage, 2005; Barrett et al., 2005). This study seeks to find out whether or not and in what ways communities currently managing forests in Cameroon, meet the capacity requirements to handle the Clean Development Mechanism (CDM) projects.

The CDM is one of three "flexible mechanisms" in the Kyoto Protocol designed to accomplish the objectives of the UNFCCC. It makes provision for investment by industrialised countries and industry in projects related to carbon emissions reduction and carbon sequestration in developing countries. These projects should contribute to sustainable development in developing countries (i.e. Non-Annex 1 countries) while enabling developed countries (i.e. Annex 1 countries with quantified emission reduction targets) to meet the Kyoto emission reduction and quantified emission limitation targets (Art. 12.2 of the Kyoto Protocol).

Land Use Land Use Change and Forestry (LULUCF) and energy projects are required to meet certain conditions in order to acquire Certified Emission Reductions from the Executive Board of the CDM. Main conditions include *additionality* (mitigation effects "with project" must be additional to what would have happened "without project"); *leakage* (project mitigation effects must not be offset by project impacts outside the accounting boundary); and *contribution to sustainable development* (to be demonstrated according to host country rules). Certified Emission Reductions represent the emission reduction or sequestration output of a project, and constitute the basis on which payments are made.

Brown et al., (2000) state that current modalities and information requirements for CDM are beyond the scope of community capabilities and skills. However few studies have attempted to test the dimensions of this alleged asymmetry between CDM modalities and procedures and local community capabilities and skills. In this paper we seek to review this gap by examining local community capacity for the development and implementation of CDM projects within Community Forests in Cameroon.

We use conceptual notions of CDM criteria and community capacity to empirically analyse two community forestry cases in Tinto and Bimbia Bonadikombo, Cameroon. The intention is to identify, document and interpret local strategies and conditions affecting past community forestry successes and failures, in order to recognise and understand those factors that might enhance or limit community capacity for CDM implementation.

The paper is structured as follows. Chapter 4.2 highlights the criteria and conditions for CDM projects and the main features of community forestry in Cameroon. Appropriate community capacity requirements for CDM projects are derived in chapter 4.3. Chapter 4.4 presents the methods used and the study context. In chapter 4.5 we evaluate community capacity and draw implications for CDM and the wider CDM/Kyoto policy framework.

By "community" is meant certain characteristics referred to in community-based natural resource management including, having reasonably defined decision-making processes; being a homogenous unit (sometimes ethnic) with shared goals and values; having traditional resource use systems and livelihood strategies; and also having a clear spatial or conceptual boundary (Armitage, 2005; Li, 2002). While these are good conceptual characteristics to work with, Li (2002) sees these as very "strategic simplifications". In many instances there is no crisp boundary between the state and the community, communities are not homogenous, having many individuals or groups that do not share community resource management goals. Property rights and decision-making systems may not also be as defined. We thus attempt to reflect these in our discussions.

We therefore see community capacity as the collective ability of individuals and groups acting in concert toward sustainable development in a given locality. In operational terms, community forests in Cameroon are managed by legal entities or community based organisations constituted by a given "community" for the purpose. But first, we present the requirements for CDM forestry projects and community forestry modalities in Cameroon.

4.2 CDM Requirements and Community Forestry

4.2.1 CDM Requirements

CDM projects are expected to meet a set of requirements prior to the issuance of certified emission reductions by the CDM Executive board. These requirements are articulated in the Kyoto Protocol and in subsequent decisions taken during the Conference and Meetings of Parties (mainly in Decisions 19/CP.9 and

14/CP.10 and the Marrakech Accords). These requirements can be summarised under the following categories: additionality, acceptability, externalities and certification.

It suffices to mention that these rules apply to afforestation and reforestation. These two are the only land use land use change and forestry activities accepted under the CDM.

4.2.1.1 Additionality

Sequestration or emission reductions due to the project activities must be "additional" to any that would occur in the absence of the project (Paragraphs 18-22 of Decision 19/CP.9). In other words, additionality implies that projects must result in a net storage of carbon and therefore a net removal of carbon from the atmosphere. Other forms of additionality include programme, financial and investment additionality. *Programme additionality* refers to project demonstration that its emission reductions are additional to emissions required by law or government policy. *Financial additionality* refers to the fact that funding for the implementation of projects must not come from overseas development or environment assistance funds. *Investment additionality* refers to the demonstration that the creation of carbon offsets will involve costs that would not be incurred in the "business as usual" scenario. Though not a requirement per se it is a way of demonstrating "intent" and effort through financial analysis.

4.2.1.2 Acceptability

The Kyoto Protocol states that all carbon offset projects in developing countries are required to contribute to sustainable development (Article 2.1 and 12.2). Host countries have to have criteria for sustainable development by which projects will be judged. In addition, projects must be consistent with other international agreements and guidelines such as the Convention on Biodiversity, Agenda 21, Ramsar and others.

4.2.1.3 Externalities (Environmental Impact and Leakage)

Projects must demonstrate a clear strategy to deal with all impacts/effects that may arise from project implementation. These impacts could include positive or negative social, cultural, economic or environmental impacts. Projects have to show how the negative impacts would be mitigated or countered.

A prominent aspect in externalities is the question of *leakage.* Leakage can be defined as unplanned emissions that could occur outside project boundaries as a result of project activities. Leakage should not disqualify a project except in instances where projections of emissions are substantial enough to negate projected carbon offsets. However, project analysis must show how leakage has been estimated and what measures will be put in place to minimize it.

4.2.1.4 Certification

The concreteness, measurability and long-term characteristics of the project will have to be checked independently by a third-party (i.e. a Designated Operational Entity) accredited by the CDM executive board. This takes place in three stages during the CDM project cycle namely validation, verification and certification.

Validation is the process of independent evaluation of project activity based on the Project Design Document against the CDM requirements. The outcome is the registration of the project.

Verification is the independent review process of monitored reductions or sequestration that occurred as a result of a registered project activity for a given period. This is an ex-post check to confirm whether or not and to what extent carbon offsets have actually been attained.

Certification is the process by which the designated operational entity gives written assurance of the emission reductions or sequestrations achieved by the project during a specified time period as verified. The result is the issuance of Certified Emissions Reductions- CERs.

4.2.1.5 Small-Scale Afforestation and Reforestation projects

Following discussions on the complications and costs involved in responding to the rules or requirements outlined above, baseline, monitoring and certification modalities were simplified for 'small-scale projects'. Decision 14/CP.10 defines small scale projects as those that will result in net anthropogenic greenhouse gas removals by sinks of less than 8 kilo tonnes of carbon dioxide per year during the crediting period. However, the host country has to approve that the project developers are a low-income community or individuals.

4.2.2 Community Forests

Many authors have argued that community forest management has the potential of fulfilling the triple objectives of biodiversity conservation, supporting local development and providing forest services such as carbon sequestration (GEF, 2000; Klooster and Masera, 2000; Smith and Scherr, 2003). Hence, if well managed, it could contribute substantially to the achievement of CDM objectives.

Furthermore, the area of forests under various forms of community management has been increasing in the world. White and Martin, (2002) note that 14% of forests in the most forested countries are owned by communities, whilst some 8% more are controlled by communities. More forests in Cameroon are coming under community management following new forest legislation in 1994 introducing community forestry. By January 2006, there were 334 applications by communities in the Ministry of Forests and Fauna (MINFOF). Of the 334 applications, 90 community forests were under full community management. Meaning the figure more than quadrupled from 17 in December 2001. At this rate, total area under community forestry could attain 1 million hectares in five years (i.e. 200 community forests at a maximum of 5000ha).

Community forestry in Cameroon was chosen for this study because the policy provisions for community forestry provides a good institutional and regulatory framework (though not sufficient) for project appraisal, approval and verification by the Sub-Directorate of community forestry in the Ministry of Forests and Fauna. Rules and regulations are elaborated in the Manual of Procedures and Norms for the Management of Community Forests (MINEF, 1998). No other forest management type in Cameroon has such a regulatory framework. We briefly present the concept of community forestry in Cameroon in the following paragraphs.

Community Forest is defined as "that part of non-permanent forest estate (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" (MINEF, 1998).

Government approves a community forest application and signs a management agreement upon community fulfilment of the following requirements,

- The community has constituted a legal entity and appointed a community forest manager who shall represent them in negotiations with government in matters of community forestry;

- The community has delineated and mapped the intended community forest area;

- The community has completed an 8-10% inventory of the timber, non-timber forest products, and wildlife of the forest;

- The community has provided a description of previous activities carried out in the intended forest area;

- The community presents a simple management plan for the intended forest; and

- The community shows proof of stakeholder agreement on the intentions of forest management.

Once the management agreement is signed, policy requirements are as follows,

- That 100 % inventories are carried out in the compartments prior to the commencement of activities;

- The management of community forests provide annual activity plans for approval;

- The management of community forests provide annual reports to government; and

- The community forest management plans are reviewed every five years.

Many community forests in Cameroon are a mix of natural and secondary forests. Some cocoa agroforests are also found within community forests as well. Therefore a broad spectrum of activities including regeneration, afforestation, logging and non-timber forest product collection is implemented within community forests.

However, current CDM rules only accept afforestation and reforestation type forestry; therefore natural forest management by communities is not eligible. But the possibility exists that forest management could be taken up by the Kyoto protocol in the future (post 2012) under different rules (Santili et al., 2005).

Private individuals, companies or government, own most current CDM projects institutions where decision-making and management are likely to have more structure and simplicity. Community ownership and management is complex and problematic in terms of resource tenure, project responsibilities, benefit allocation and governance aspects. CDM rules have not been tested in these complex communities that harbour tremendous biosphere carbon management potential.

4.3 Community Capacity Assessment Framework

Project developers are required to put forth arguments and supporting evidence for each CDM requirement in a Project Design Document. Special knowledge, skills, technology and infrastructure are also needed for collecting and analysing the required evidence. Furthermore, planning, coordination and management skills will be required in the project development process.

In the ensuing paragraphs we review specific tasks of each requirement in order to elucidate dimensions of community capacity requirements. Table 4.1 presents a summary of the resulting assessment framework of community capacity for CDM forestry projects.

Table 4.4 CDM community capacity assessment framework

CDM requirement	Community Capacity Requirements
Additionality	❑ Does the community have access to adequate financial resources for baseline and other analysis? ❑ Does community have access to required technology for data collection and analysis? ❑ Does community have access to necessary human resources (knowledge and skills)?
Acceptability	❑ Are the necessary national sustainable development policy analysis knowledge and skills available within the community?
Externalities	❑ Are the necessary impact assessment and leakage analysis knowledge and skills available within the community?
Certification	❑ How adequate is the community forest monitoring system? ❑ How adequate is the community information infrastructure? ❑ Is the relevant CDM information (forest inventory, socio-economic) available? ❑ Does community have required financial resources to engage Designated Operational Entities?
Management Capability	❑ Are actors effectively participating in decision-making and implementation? ❑ How effectively are resource rules being implemented? ❑ How good are actor relationships in forest management? ❑ Are communities receiving adequate government and NGO support?

Additionality: The draft tool for the demonstration of additionality proposes a five-step screening and analysis procedure for CDM projects including,

- Preliminary screening based on the starting date of the project activity and the specific features of the afforestation and reforestation activity (Mapping and map analysis, land use analysis);
- Identification of alternatives to the project activity consistent with current laws and regulations (land use analysis, estimates/measurements of carbon stocks, projections, baseline development);

- Investment / financial analysis (Internal Rates of Return, Net Present Value, cost benefit ratio, sensitivity analysis etc.)
- Barrier analysis (investment, institutional, technological, cultural, social, ecological and other kinds of barriers); and
- Impact of CDM registration (Expected).

The above-mentioned steps are indicative of the knowledge and skills required to provide valuable arguments and evidence on additionality.

The draft tool for additionality also specifies that evidence regarding land use can be provided from land use and land cover maps and satellite images of around 1990. This means access to mapping technology as well as other technology for measurements of soil carbon or biomass estimation will be required. Lee (2004) concludes that most of the information is technical, requiring good knowledge and skills and technology to collect and manage.

It can be argued that communities may hire these services, but the costs can be very high. Recent studies in Tanzania revealed that costs for carbon inventories done by communities (with minimal supervision) would be 10 times or more cheap than when experts are contracted (Zahabu, 2006). Community inventory costs ranged between 2.5 and 21 $/ha/yr. Transaction costs for afforestation and reforestation has been estimated at between $8-31/tC (Poffenberger et al., 2002) and $0-70 /tC (de Jong et al., 2000).

Eligibility: Demonstrating compliance with national sustainable development rules involves engagement with the national authorities and providing evidence. For community forestry in Cameroon, "sustainability" implies creating a legal entity, ensuring participation, developing a simple management plan and developing a benefit sharing mechanism. Technical expertise and resources (financial and material) are thus required to provide the evidence.

Externalities: Environmental impact assessments and social impact assessments are required of each project. The project is also required to show how they will mitigate or solve any negative impacts identified by studies. The same holds for leakage. Relevant knowledge and skills as well as resources are thus required to carry out these studies and design mitigation measures.

Certification: A monitoring plan must be provided for all the variables estimated in the project design document. This requires a demonstration of how information would be collected and archived to enable validation and verification by the designated operational entity. The data collection, processing, storage, retrieval and sharing with the operational entities demand a certain level of data and information infrastructure. By data or information infrastructure is meant the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to data relevant for the implementation of carbon forestry.

Negotiations, contracting services and communication with the operational entities involve costs and specific skills. EcoSecurities (2002) estimates the costs of validation at between $18,900 and $37800 and verification costs at about $9400 per audit. Prototype Carbon Fund cost estimates are slightly higher (Lee, 2004).

Management Capabilities and Conditions: Though not a direct CDM requirement, management remains a critical success factor for CDM projects, hence it is being incorporated by operational entities in validation processes. Nelson and de Jong (2003) demonstrate the importance of institutional arrangements in rule setting, enforcement and monitoring for carbon forestry projects in Chiapas, Mexico. Poffenberger et al., (2002), cite interalia, effective institutions, democratic leadership, transparency in decision-making and public expenditures and minimizing social conflicts as important success factors for community carbon forestry. Subak (2000) also underscores the role of governments and NGOs in providing technical and institutional support for carbon mitigation projects in Costa Rica. FERN (2000) reported conflicts resulting from resource tenure perceptions that created serious problems for a carbon project in East Africa.

Based on the preceding paragraphs, we raise key questions for community capacity assessment under the four CDM requirements. We also include a category on Management capabilities and conditions - see table 4.1 (Ivey et al., 2004). The various issues discussed in this framework are interrelated; hence we try to show these interactions as much as possible based on our empirical evidence.

4.4 Methods and Context

4.4.1 Methods

This study aims at evaluating community capacity to meet CDM conditions. To do so, we create a framework (table 4.1 above) and seek empirical evidence by way of case studies. We identified two communities in Cameroon for the study: Tinto and Bimbia Bonadikombo (hereinafter called Bimbia). The choice of these communities was based on the willingness to provide data and the relative homogeneity / heterogeneity and accessibility of the communities. All three villages in Tinto and four villages in Bimbia are typical small rural livelihood-based settings, while two settlements in Bimbia are relatively larger and peri-urban. The fact that these cases were not initially conceived for CDM purposes constitutes a limitation in the study.

Data collection tools included semi-structured interviews (19); structured-interviews / questionnaires (84), focus group discussions (6), secondary data review and forest transect walks. Given the substantive nature of the dimensions of community capacity, more discursive data collection tools were selected (Frankfort-Nachmias and Nachmias, 1996; Yin, 1994). Questionnaires were used for selected community resource persons to understand the relevant community knowledge and skills pool. Data sources included community forest legal entities, Ministry staff, traditional authorities, NGO staff, community / user groups and municipal authorities. Documents analysed included various planning, monitoring, seizure and study reports. Interviews were used to obtain insight and check the information from secondary sources and other tools. Thematic and issue based content analysis was used to analyse the transcripts and secondary information for answers to questions in the community capacity assessment framework.

4.4.2 The empirical setting

The *Tinto community* consists of three neighbouring villages of the same clan namely Bessinghe, Kerieh and Mbu. The total population of between 1700-2000 is very homogenous with less than 1% "outsiders". It is typically rural, but is an administrative (District) headquarters with a forestry office. Most farmers grow cocoa or coffee as cash crops, alongside cassava, maize and other subsistence crops. Forest activities include hunting, collecting non-timber forest products and timber. Tinto began a community forest planning process in November 1999 and signed a management agreement with government for an evergreen lowland forest area of 1295 ha in December 2002. But little has happened by way of management to date.

The *Bimbia Bonadikombo community* is a complex of many villages namely, Mbonjo, Chopfarm, Banangombe, Bonabile, Dikolo, Mabeta, Ombe Native (Bamukong), Bonadikombo and several plantation worker camps. Two of these settlements (Bonabile and Dikolo) are larger and peri-urban in character and located on the fringes of the Limbe (Victoria) town (see figure 1.3). Limbe and the surrounding areas have a population of about 123,900 inhabitant (RCDC, 2002). It is highly heterogeneous with few local people (of the Bakweri tribe). Forest extraction activities in order of importance include, collection of non-timber forest products, fuel wood and timber, charcoal burning and hunting. The community has been managing a 3700 ha forest since mid 2002. Vegetation is evergreen with different types: littoral vegetation, mangrove, freshwater swamp forest, stream and riverside vegetation, and lowland rainforest.

4.4.3 Community Forest Actors

A nested institutional structure can be observed in both the Tinto and Bimbia communities. There are user groups, community based organisations created for community forest management purposes and traditional authorities, all of which are moulded and developed within the locality (Tekwe and Percy, 2001).

These organisations work closely with the forest administration and NGOs. Table 4.2 presents a summary of actors, their interests and responsibilities within community forests in these communities.

The make up of institutional structures differs slightly between the two communities and some actors such as charcoal burners are only found in the Bimbia community. It is worth noting that forest use and livelihood activities often involve combinations of activities. But we present the actors in terms of forest use activities in order to capture specific issues that could otherwise be diluted in the analysis of various activity combinations.

4.5 Assessing Community Capacity for CDM project development

In this section, we evaluate community capacity in the light of CDM requirements and the corresponding community capacity requirements (Table 4.1), including mainly additionality, acceptability, externalities, certification and management capabilities and conditions. Table 4.5 provides a summary of the findings.

4.5.1 Additionality

The key additionality capacity questions to address is whether or not communities have access to the financial, technological and human resources required to fulfil additionality requirements.

In terms of financial resources, total annual income in 2005 for *Bimbia* stood at $ 31, 200 (see table 4.3). At the end of that year Bimbia was running at a deficit of about $3000. Total income in *Tinto* stood at $10,150. 100% of the reported income for Tinto during this period was an advance payment for timber exploitation. Prior to this deposit, all income for the Tinto community forest over three years was a grant from Living Earth amounting to $800.

Table 4.5 Summary descriptions of community forestry actors

Actor	Interests and Responsibility
1. Bimbia Bonadikombo Natural Resource Management Council (BBNRMC)	Manages Bimbia forest; Has an elected Board and a Forest Management Officer overseeing day-to-day operations
2. Tinto Clan Community Forest – Common Initiative Group (TCCF – CIG)	Manages Tinto forest; Has an elected Management Committee and a Forest Management Officer in charge of day-to-day operations.
3. Chiefs	Village heads; custodians of forests; authorise access to all resources and land; in both cases are members of the BBNRMC board and TCCF-CIG committee respectively
4. Forest User Groups	Includes all user groups; interested in access rights; participate in general assemblies of organisations; In the case of Bimbia, each user group has a representative on the Board
5. Women in communities	Interested in access rights for non timber forest products and farmland
6. Elites	"Successful" sons and daughters living outside the community (*as defined by these communities*); interested in broad village development;
7. Ministry of Forests and Fauna (MINFOF)	Mandated to ensure sustainable forest management; provide technical support; conflict resolution
8. Municipal Authorities	Interested in contributions of community forest to development of municipality
9. Non Governmental Organisations (NGOs)	Interested in sustainable forest management; provides technical, institutional and financial support Mount Cameroon Project supported Bimbia, while Living Earth Foundation supported Tinto.

Considering mitigation potential and transaction costs (chapter 4.3) for various averted deforestation, reduced impact logging and regeneration carbon scenarios as in table 4.4, and the financial resources of both communities, the investment requirements will be extremely difficult if not impossible for these communities without external support. Table 4.4 was calculated by using a chronosequence of mean carbon content and rates of carbon saved under different land use options in Cameroon. We estimated that the Bimbia forest could mitigate between 7-12.4 Kt C y^{-1} and the Tinto forest between 1.7–5.3 - see table 4. With production potentials of less than 8 Kt Co_2 y^{-1} (2182 tC y^{-1}), both projects could qualify for small-scale CDM. This means they can reduce transaction costs by up to 50%. Yet with the current financial situation, they are unlikely to meet the investment requirements.

Table 4.6 Estimated income and expenditure of community forests (January - December 2005)

Description	Bimbia Bonadikombo	Tinto
Income		
Total (XAF / USD)	14,867,000/ 30200	*5,000,000 / 10150
From forest operations-wood (%)	28.5	100
From grants/ donations (%)	10.4	0
From service delivery (ecotourism and tree care services to Urban Council (%)	23	0
Fines and auction sales (%)	19.1	0
Loans (%)	18.8	0
Expenditure		
Total (XAF / USD)	15,910,000 / 32300	940,000 / 1900
Operational costs -Office (%)	11	100
Operational costs- Field (%)	23.4	0
Salaries (%)	62.8	0
Investments (%)	0	0

* This amount represents a deposit made by a potential timber exploiter in November 2005, as proof of liquidity.

Community forestry as practiced in both communities is multi-activity and can entail prohibitive negotiation costs (Smith and Scherr, 2003). De Jong et al., (2000) reported costs of participation, negotiation and conflict prevention in the Scolel Te project in southern Mexico ranging from \$52-325/ha. Such costs and those to be incurred on impact prediction, validation and verification are not part of the concessions on small-scale CDM projects, yet these costs in themselves could be prohibitive to CDM project uptake and development.

Secondly, an analysis of pre 2005 financial records in both communities revealed they received overseas development assistance for community forestry implementation- (11.70% of income for Bimbia and 100% for Tinto –table 4.3). Because communities received overseas development assistance for completely different project purposes, they may become ineligible under the financial additionality criterion.

Technical resources such as satellite images, GPSs and tree height measurement instruments would be helpful in providing information required for baseline estimation. None of these communities have direct access to satellite images or facilities to process them. *Bimbia* can access images through the GIS unit of nearby Mount Cameroon Botanic Gardens and Conservation Centre. But they have to pay for it. Access to free satellite data from the Internet would be difficult given the very weak connectivity services in the region. Bimbia has one GPS that can allow them to map current land use. *Tinto* has a compass that can be useful for inventories.

Table 4.7 Projected carbon mitigation potential for community forests

	Without Project	With Project Scenario 1[c]	With Project Scenario 2[c]
Tinto Community			
Total Area (ha)	1295		
Vegetation type	Natural forest		
Scenario Description	Conversion	Averted DEForestation (ADEF)- Conservation	Reduced Impact Logging (RIL)
Potential Area (ha) / yr		7.77	52
Carbon gain -tC ha^{-1} [a]	-	220	104
Total Carbon saving (Kt C y^{-1}) [b]	-	**1.7**	**5.3**
BB Community			
Total Area (ha)	3714		
Vegetation type	Natural forest - 50% and mixed cocoa farms and secondary forests –50%		
Scenario Description	Conversion	ADEF – Conservation of natural forest / Conservation + regeneration Conservation + regeneration	(RIL) / Conservation + regeneration Conservation + regeneration
Potential Area (ha) / Yr		11 (ADEF)/ 928 (Conservation)	74 (RIL) / 928 (Conservation)
Carbon gain -tC ha^{-1} [a]	-	220 (tC ha^{-1}) / 5 tC ha^{-1} y^{-1}	104 / 5 tC ha^{-1} y^{-1}
Total Carbon saving (Kt C y^{-1})	-	2.4 / 4.64 **7.04**	7.7 / 4.64 **12.34**

[a] Mean Annual Carbon gain values for various project scenarios are assumed from reported studies in Cameroon as follows, ADEF, (Kotto-Same et al., 1997; Purdon, 2004); RIL, (Justice et al., 2001); and Regeneration, (Palm et al., 2000).

[b] Total Carbon savings are given as Σ(Carbon gain x potential area)

[c] General assumptions for scenarios are:

- Secondary forests are made available for conservation and regeneration
- There will be no fires, droughts or disasters during the project lifetime
- Illegal logging will be minimal and not sufficient to significantly affect project
- Forest areas do not include roads, water bodies and minor human settlements
- Exercise of usufruct rights for subsistence purposes including fuel wood, and non timber forest product harvesting is unlikely to significantly affect carbon flows

The human resources required for related additionality analysis is currently limited in both communities. 14 *Bimbia* and 11 *Tinto* community members received training on timber inventories during the process of developing the simple management plans. The main skills acquired included doing physiological measurements (tree heights, dbh), using the compass and or the GPS, tree identification and laying out sample plots and transects. But the skills required for carbon estimation are more complex, including biomass estimation, using allometric equations, root biomass estimation, measuring trees of all diameters, destructive sampling etc. These technical carbon estimation skills are absent in both communities.

Skills for financial and investment analysis are absent in these communities. One of the staff in *Bimbia* has basic undergraduate course knowledge in cost-benefit analysis but this is not enough. The community would thus have to hire such services at high costs. In *Tinto* no one had such skills and knowledge.

4.5.2 Acceptability

The main capacity question in the acceptability criterion is do communities have the knowledge and skills to provide evidence of project contribution to sustainable development? According to the current community forestry regulations, "sustainability" is demonstrated by the development of a simple management plan, a viable legal entity, a benefit sharing mechanism, and planned community projects (MINEF, 1998). Both communities fulfilled these conditions, thanks to previous financial and technical assistance from NGOs and projects (McCall and Minang, 2005). Mount Cameroon Project helped *Bimbia* while Living Earth Foundation assisted *Tinto*. Hence we can say that both communities adhere to what sustainable development criteria there are.

However, problems may emerge if national sustainability criteria for CDM eventually include international environmental conventions.

4.5.3 Externalities

The key capacity question addressed below is, do communities have the knowledge and skills for the required impact assessment and leakage analyses.

Five persons (three employees and two board members) in *Bimbia* have at least undergraduate knowledge and some experience of environmental and social impact assessments. This means they have a good chance of providing the evidence required by this criterion of the CDM. On the other hand, none of the *Tinto* members had any knowledge of environmental or social impact assessments. No respondent in both communities had any understanding of leakage.

4.5.4 Certification

Communities would have to collect, analyse, archive and eventually share information with designated operational entities responsible for validation and verification. Hence, the key capacity questions for certification include, how functional are community forestry monitoring systems? How adequate are community information infrastructures? And do communities have enough financial resources to engage Designated Operational Entities for validation?

Monitoring and reporting mechanisms in both communities suffer serious inadequacies. Monitoring and reporting in *Bimbia* is characterised by monthly management council board meetings at the managerial level, and by forest patrols at operational level – 186 patrols in 2005. These meetings and patrols result in reports. However, the patrols are for the most part erratic, triggered by tip-offs on illegal activity. In 2003 control posts or check points that could be manned for 24 hours were made at strategic outlets from the forest, but were later abandoned by the operation committee members. It is alleged that the control posts system did not give the room for corrupt practices desired by some operation committee members, hence the abandonment. Some of them negotiate and collect fines from defaulters without the knowledge of the management officer. In extreme cases they cooperate with illegal timber exploiters. In the case of *Tinto*, no monitoring or reporting of any sort has been done since December 2002 when the management agreement was signed. The community explain that with "zero" activities in the community forest, there is no reason to report. Given that these monitoring systems were not meant for CDM projects, they would need to be overhauled if these projects are to be registered within the CDM. However, the corruption and institutional planning problems currently experienced would still pose serious difficulties for CDM monitoring.

Neither community has conducted post management agreement forest surveys or inventories of designated exploitation compartments as required by law. They have equally failed to convene general assemblies of stakeholders to discuss and review progress as their statutes demand since the commencement of community forest activities.

Community information systems were found in both cases to have relevant biophysical, socio-economic and market data that could be used for further analysis on impact, baselines, leakage and other CDM requirements. However, inventory data available to these community forests are inadequate for carbon estimation as they were done for timber exploitation as required by extant community forestry rules. Most of these studies were done with the help of NGOs prior to the management agreement. As demonstrated in the preceding paragraphs, further collection of complementary data for CDM without such assistance may be less reliable because communities do not have adequate skills.

Material and technological resources (infrastructure) can tremendously influence project information management. *Bimbia* currently has limited office space within the premises of the Divisional Office for Limbe. They have four operational computers and a digital filling system for all reports. Hard copies of reports are stored on shelves totalling about four metres in length. With a motorbike, 12 staff and little funds to hire cars regularly, transportation is a serious hindrance to monitoring efforts. *In Tinto* activities are run from the forest manager's house. All information for the Tinto community forest is found in two cardboard folders.

4.5.5 Management Capability and Conditions

In this section we examine the extent to which community decision-making processes, rules compliance, actor relationships and relationships with government and NGOs are adequate for carbon project development.

4.5.5.1 Participation and decision-making

Involving actors in building consensus and decision-making for CDM project implementation is important for local communities (de Jong et al., 2000, Smith and Scherr, 2003). Participation in decision-making is largely by actor representation in the decision-making bodies within the legal entities managing the forests on behalf of the communities. The management board in *Bimbia* is made up of chiefs, elected user group representatives and some employees such as the forest manager. It meets on average 10 times a year. Attendance sheets show charcoal burners, as the only consistent user group participating at these meetings. Timber exploiters and the fuel wood harvesters have been persistently absent. Latent power struggles within the leadership have weakened decision-making processes. The six chiefs in Bimbia sent a letter to the acting forest manager complaining that they were not being sufficiently consulted on day–to-day forest management issues such as issuance of permits (Letter of January 2005).

In Tinto, the management committee is made of all three chiefs, village representatives and the forest manager. It has met about five times since December 2002. Interviewees reported about four adhoc meetings between the manager, two chiefs and one board member for consultation on proposals for sale of standing volume within the community forest between 2003 and 2005. Power struggles over money have also weakened decision-making in Tinto.

All three chiefs in Tinto complain of not being consulted by the manager especially on financial issues. Given observed actor reactions and comments during informal discussions, it is our reasoned judgement that this is an important issue that contributed to the inertia in the take off of community forestry activities in Tinto. These systems still harbour many weaknesses that may inhibit consensus-building processes for carbon forestry.

Annual general assemblies in which popular community participation is expected have not been convened in either case since mid 2002, implying that actors have not had the opportunity to participate in more strategic decision-making in community forestry.

4.5.5.2 Implementation of community forestry rules

An assessment of *community forestry rules compliance* produced mixed results. *In Bimbia,* annual legal timber exploitation has been between 500 to 700m^3. About 5000 trees have been planted in two of three compartments envisaged in the management plan. There has also been good cooperation with charcoal burners in the implementation of management rules.

However, in Bimbia the rules have also been seriously flouted. Deforestation and degradation has been accelerated by farming and illegal timber exploitation. Illegal fuel wood harvesting is rife in the accessible southeast and western compartments of the forest. For example, in 2005, 186 forest monitoring patrols were conducted. During these patrols the following were confiscated, 49 chain saws, 2000kg of charcoal (100 bags of about 100kg), 301 small fuel wood chunks and 1254 sawn timber boards of various sizes (4x8cm; 4x12cm etc). Income from fines and sales of confiscated products amounted to about $5700 (2, 840, 000 XAF), representing about 67% of total income from about 655m^3 of legal logging from the Bimbia forest. These numbers are explained by easy accessibility to the Bimbia forest, which is located a few kilometres from Limbe town.

The *Tinto* community had agreed to exploit 2000 m^3 of timber annually from the forest. But in three years nothing has happened. They advance the absence of an access road and lack of start-up resources as reasons for the inertia. Negotiations for timber exploitation are ongoing. The above evidence suggests many potential inadequacies regarding rules compliance for carbon forestry.

Table 4.8 Summary of findings

Requirement	Bimbia Bonadikombo	Tinto
Additionality: *Access to financial resources*	Insufficient financial resources. Deficit of $3000 in 2005 accounts; Little experience with high interest loans; Eligibility unlikely due to use of ODA funds in forestry implementation	Insufficient financial resources. Functioning for past three years with $784 in total; No experience with loans; Eligibility unlikely due to use of ODA funds in forestry development.
Knowledge and skills	Limited knowledge and skills. One person with undergraduate knowledge of cost benefit analysis and none in investment or financial analysis methods. 14 employees have knowledge and skills in timber inventories only.	Knowledge and skills are extremely limited. No knowledge or experience of financial or investment analysis in community. 11 people have knowledge and skills in timber inventories only.
Access to Technology:	Little or no access to satellite data and other technologies required.	Same as in Bimbia
Acceptability: *Knowledge and Skills*	Community fulfilled "sustainability" criteria in the development of management plans with NGO support. Hence have some relevant experience.	Same as in Bimbia
Externalities: *Environmental impact and leakage*	Three members in community have knowledge skills and experience in environmental and social impact assessment, therefore good potential	No knowledge or skills in environmental or social impact assessment observed
	No knowledge or understanding of leakage observed	Same as in Bimbia
Certification: *Monitoring systems*	Monitoring systems are functional, but inadequate for CDM because they do not involve ongoing inventories; Short of manpower (ratio of staff to forest area is 1:285 ha)	No documented evidence of monitoring. The lone staff cannot ensure any proper monitoring for an area of 1295ha.
Information system	Both physical and digital Information systems (computers) are operational. This can allow for "sharability", hence the system is potentially adaptable to CDM archiving requirements.	Information system consists of two cardboard folders. Hence inadequate in form, content and quality for CDM purposes.
CDM Information availability	Some relevant geographical, socio-economic, ecological and general information is available for CDM use within current systems. But much more is required	Same as in Bimbia
Financial resources	Inadequate financial resources to pay for validation services	Same as in Bimbia
Management Capability: *Actor relationships*	Conflicts exist, (i) between 6 chiefs and management board of community forest; (ii) between community –MINFOF over 14 permits and proceeds from auctioning of seizures; and (iii) between farmers and forest management.	Conflicts between 3 chiefs and management officer.
Forestry rules enforcement	Illegal activity income accounts for about 67% of income from legal forest activities and 19% of total revenue in 2005. Meaning it is significant and poses threats to the success of potential carbon project.	No illegal activity observed. Rules are being respected.
Government – community relationship	Government short of forestry personal (staff to forest area ratio in the province is about 1: 15000ha); Government staff do not understand the CDM and have no relevant skills to support communities	Same as in Bimbia
NGO-Community relationship	The Cameroon Mountain Conservation Foundation (CAMCOF) is interested in providing support for carbon forestry in the area, but lack the knowledge, skills and resources.	Living Earth Foundation is interested in providing support for carbon forestry in the community, but lack the knowledge, skills and resources.

4.5.5.3 Actor Relations

Good actor relationships are necessary for success in carbon forestry. Figure 4.1 presents the state of relationships between the actors in the Tinto and Bimbia communities. The figure was developed mainly from interviews and secondary data, and discussed and validated with other actors especially those not interviewed.

Varied land tenure perceptions have affected the actor relationships in community forestry implementation in Bimbia. *In Bimbia* it was agreed with the representatives of all actors during the land use plan and the simple management plan phases, that each farmer within the forest would pay a registration fee of 2000FCFA ($ 3.5), after which his or her farm would be assessed and annual rents determined. Less than 100 of the estimated 1000 farmers have registered. Farmers think registration is only a pretext and that rents might eventually be prohibitive, thereby kicking them out. They emphasise that the spirit of pre-community forest indigenous organisations such as the Victoria Lands and Forest Conservation and the Victoria Area Rainforest Common Initiative Group that aimed at ejecting “non-native usurpers” from their forest still prevails. Such land tenure perceptions and issues of trust explain the poor relationships between the management council and farmers or fuel wood collectors (figure 4.1) especially because many users of the forest are non-native.

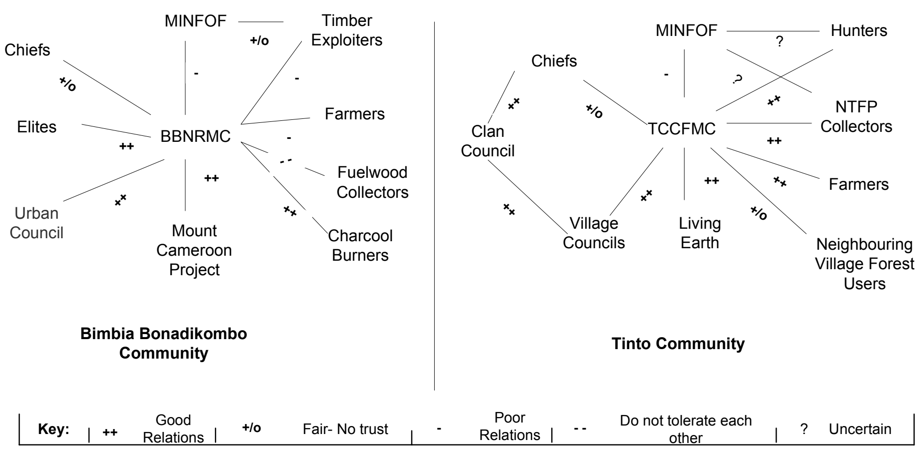

Figure 4.3 Sociogram showing community forest actor relationships in both communities

Relations between communities and government can influence community project development and risk management in terms of enabling training and improving access to resources and technology. It could also stifle progress when conflicts arise in their relationship.

Community forestry policy stipulates that the Ministry of Forests and Fauna (MINFOF) is supposed to provide technical support to communities in forestry activities, but working relationships have been poor in both cases. Poor working relationships arise partly from lack of clarity in roles and responsibilities. The *Bimbia community* accuses MINFOF of illegally issuing about 14 logging permits within their forest, and lack of transparency with auction sale dues from joint seizures. MINFOF says Bimbia has no right to sanction defaulters while Bimbia insists the law allows them to deal with minor offences. The line between major and minor is not clear even for the neutral interpreter of policy. These examples of disagreements have created conflicts between the community and forest administration staff (see figure 4.1).

It is clear that communities will need external assistance with complex carbon measurement and monitoring tasks such as use of allometric equations, soil laboratory measurements, access to remote sensing technology and information management. This would be expected from MINFOF, but the question is whether this government body is in a position to provide such assistance. To start with, technological know-how and resources are in short supply in this government department. Existing allometric equations were developed for known marketable timber species only. Available and useful remote sensing and GIS data is limited to 1950 and 1991 aerial photographs covering some forest areas in the country. These could be used as evidence for land use and land cover for critical date requirements for CDM - December 31st1989 for example. Staff and resources in the ministry are inadequate for supporting communities (Ekoko, 2000). The ratio of staff to forest area in the southwest province, in which both Tinto and Bimbia are located, is about 1:15000ha. A senior forestry official acknowledged that they are so badly equipped that they sometimes ask for transportation or material support from communities in the fulfilment of their tasks. Staffs in most cases have little knowledge of carbon issues.

Relations between communities and NGOs have been good. NGOs or bilateral projects have provided the support communities need for forest management. For example, in Bimbia, Mount Cameroon Project (GTZ-DFID funded) facilitated workshops on community forestry regulations and helped with the establishment of the legal entity. It also financed hired expertise for the training of community members and subsequent implementation of mapping, forest inventories and the development of simple management plans. Living Earth Foundation used a similar approach in the case of Tinto. This support by NGOs continued through the entire community forestry-planning process and the early stages of implementation (late 2003- early 2004).

But very often these NGOs have been using overseas development assistance funds. Such funds may not be acceptable under the CDM given the financial additionality criterion. This makes compelling argument for the creation of a national fund to support CDM project development.

A summary of the findings is presented in Table 4.5. While the synthesis shows that communities have benefited in terms of income, knowledge and skills acquisition and employment, it also reveals serious inadequacies in human, financial and technological resources required for successful community forestry implementation. In comparative terms, Bimbia faired better with regards to resources. Perhaps Tinto's remote location and relatively smaller size explains the difference in resource availability.

Regarding management capability and conditions, a mix of similarities and differences can be noted. In similarities, both communities have received NGO support and have also had conflicts with forest administration on various issues. In differences, *Bimbia* has experienced substantial internal conflicts, high levels of illegal activity, forest degradation and staff corruption. *In Tinto* the forest has remained intact due to the absence of activities, owing mainly to the remoteness of the area, and lack of start up resources and entrepreneurship. These differences illustrate that local community capacity is a result of the unique manner in which these attributes coalesce in particular places and therefore should also be seen to a very large extent on a case-by-case basis (Agrawal, 2001; Armitage, 2005).

4.6 Conclusions and Practical Implications

Several studies have supported payment for environmental services within the commons as an emerging model of sustainable development for poor communities. Yet community capacity to implement such models often falls short of expectations. This paper set out to assess the capacity of communities to implement CDM projects in Cameroon. From experiences of success and failure in community forest implementation, we draw conclusions on the implications for CDM implementation within community forestry set-ups, i.e. in the case where communities currently managing forests decide to add on carbon sequestration as another land use.

Analysing the dimensions and determinants of community capacity for CDM in both the Bimbia and Tinto cases point to substantial inadequacies. It indicates that taking up CDM carbon management procedures complicates the challenges of local communities already grappling with huge community forest management difficulties within host country modalities and procedures. The inadequacies revealed serve as good arguments for varying dimensions of additionality in the CDM certification process. But more importantly however, evidence from the Bimbia and Tinto cases, though limited, also points to a number of generalizable observations on community capacity to manage terrestrial CDM projects.

Firstly, proactive capacity building measures are needed to increase project uptake in poor countries. Our case studies highlight evidence that local communities lack the knowledge, skills and technical and financial resources to accommodate current CDM rules. Management capabilities and conditions are also deficient in many ways. Tasks for baseline estimation, investment, financial, environmental and social impact and leakage analysis cannot be met under poor community conditions in Cameroon and many parts of sub-Saharan Africa. This evidence supports previous explanations for why Africa is lagging behind in CDM project development – i.e. currently accounting only for 1.7% of all projects in the CDM pipeline (Desanker, 2005). This raises serious questions about the potential of CDM contributing to sustainable development in its current form.

Due attention should therefore be given to multiple partnership arrangements and most especially to NGO capacity for supporting CDM implementation processes (Nelson and de Jong, 2003). The Bimbia and Tinto cases point to the potential role NGOs can play in enabling project uptake and development. However, any community capacity approach for CDM needs to carefully consider tasks to be undertaken by communities and those to be undertaken by external agencies or consultants. This is because, NGOs or consultants are developing many energy projects within the CDM and in some cases they get paid a proportion of the anticipated credits. Replicating such a scenario in CDM forestry could mean ignoring local competencies, thereby diverting vital community benefits in the form of credits. Sharing such roles and responsibilities especially vis-à-vis project developers and other partners, could help reduce conflicts and facilitate institutional relations and hence resource governance. This could be beneficial for the development of other environmental services systems for water catchments or biodiversity.

Secondly, managing actor relationships as influenced by their motivations, perceptions and resources, within multiple use forestry projects, is a great challenge regarding risk of project failure, leakage and costs of CDM projects. Involving actors in building consensus and compliance is difficult and costly for local communities (de Jong et al., 2000; Smith and Scherr, 2003). The knowledge and facilitation skills required are enormous, therefore taking on carbon, as another community forestland use will compound the knowledge and skills demands. Such evidence should support the prioritization of institutional capacity building for developing countries called for in Decision FCCC/CP/2004/L.11, and other documents within the Subsidiary Body for Implementation capacity building framework of the Kyoto Protocol.

Thirdly, this research brings a number of cross-scale CDM issues to the fore. It shows that community capacity depends on and is part of a forest / land use policy framework. The CDM framework assumes that the necessary macro institutional and regulatory support for micro level implementation would be available. This study found out that neither sustainable development criteria nor supportive institutions and personnel exist in Cameroon.

Developing national CDM guidelines for both forestry and energy projects might be necessary (but not sufficient) condition for CDM project development at local level. It can be beneficial in providing institutional structure and for specifying critical standards on impact assessment, monitoring, measures preventing risk of project failure and information management for CDM forestry projects. This supports earlier contentions that some regulation may be required to reduce livelihood risks and increase social benefits (Smith et al., 2003)

Supporting Designated National Authorities and allied ministerial services to provide proactive capacity building to poor communities is imperative for Kyoto Protocol processes if CDM must succeed. This could help provide badly needed support from government institutions in the areas of resource/incentive provision, training, information management, monitoring and marketing. Costa Rica is an example of a non annex 1 country that has instituted proactive measures of this kind (FAO, 2004; Subak, 2000). An opportunity exists for the creation of a national fund to support CDM projects to help provide start up funds for communities in Cameroon. Such a fund could tap from the coffers of the Special Forestry Development Fund- a mechanism that enables a proportion of forestry tax revenues to be reinvested into forestry development. Putting such funds into capacity building and not project implementation could be justifiable under the CDM.

Finally, there is need for a rethink of current CDM forestry modalities. Current rules are complex, unfeasible and unfairly beyond the capacity of poor communities such as those assessed in this study. Thus confirming previous conclusions in Brown et al., (2000) and Poffenberger et al., (2002). It may also explain (at least in part) why India, China, Brazil and Mexico combined, hosted 83% of all CDM projects, while Africa hosted only 2% by June 2006. Provisions for small-scale CDM forestry projects are not far-reaching enough. They do not currently consider basic environmental and social impact and community negotiations costs but our research demonstrates that they pose equally strong challenges to CDM project development even in instances where less than the small-scale threshold mitigation value of 8 kt C y^{-1} apply. If the sustainable development objectives of the CDM and the Kyoto Protocol must be attained in the poorest countries, further consideration should be given to CDM modalities in the ongoing post 2012 forestry negotiations. This study and others provide a growing body of evidence on community capacity for carbon forestry that could help in the development of more realistic and equitable CDM rules.

Chapter 5

Local spatial knowledge and forest eligibility in the Clean Development Mechanism*

* In Preparation

Abstract

Local communities in developing countries are often data scarce environments, yet accessing payments and benefits for environmental services such as carbon mitigation and certification of forest resources require enormous technical information. Local spatial knowledge can be a repository to draw from in these communities, but its characteristics present drawbacks for acceptability. In this paper, we employ Participatory GIS (PGIS) and assess the "value-added" of eliciting local spatial knowledge for determining forest land eligibility within the Clean Development Mechanism (CDM). Our case study applies participatory rural appraisal, GPS surveys and remote sensing on CDM land eligibility criteria for a community forest in Bimbia Bonadikombo, Cameroon. We compared local recollection of forest cover as captured in sketch maps, narratives and GPS points for 1980 and 1990 to land cover maps generated from satellite imagery of corresponding periods. We found that visual interpretation of patterns of farm and forest boundaries for these periods significantly matched. An overlay of points from both local recall and land cover maps showed a match of between 51% and 70 %. Though PGIS added value to local knowledge in terms of form, content and quality, evidence from comparing PGIS maps to land use maps generated from satellite images was merely moderately convincing on reliability of PGIS use for CDM eligibility. We argue that PRA and remote sensing should rather be seen as complementary evidence for CDM eligibility, rather than PRA being considered inferior to remote sensing data as current CDM rules indicate.

Key Words: Indigenous knowledge, Local Spatial Knowledge, Participatory-GIS, Clean Development Mechanism, Community Forest, Cameroon

5.1 Introduction

The Kyoto Protocol of the UNFCCC set out specific targets for green-house-gas reductions for industrialised countries (Annex 1 countries) —to less than 5% of the 1990 levels between 2008 and 2012 (UNFCCC, 1997). The Clean Development Mechanism (CDM) is a mechanism designed to help achieve this target. The CDM allows for the development of greenhouse gas mitigation projects in "Land Use, Land Use Change and Forestry" and energy sectors in developing countries (Non Annex 1 countries) to help developed countries (Annex 1 countries) meet their targets, and also to contribute to sustainable development in the project host countries.

Land Use, Land Use Change and Forestry - LULUCF projects must meet certain conditions spelt out mainly in the Marrakesh Accords and in Decisions 19/CP.9 and 14/CP.10 of the Kyoto Protocol in order to acquire Certified Emission Reductions (CERs). Main conditions for issuing CERs and approval include: *eligibility* (meaning all projects must be on land that suits the country definition of forests and should not have been forest by December 31st 1989 or 50 years ago for reforestation and afforestation respectively); *additionality* (mitigation effects "with project" must be additional to what would have happened "without project"); *leakage* (project mitigation effects must not be offset by project impacts outside the accounting boundary); *impact* (all projects must carry out an impact assessment study and present mitigation strategies for negative impacts if need be); and *contribution to sustainable development* (to be demonstrated according to host country rules);

Fulfilment of these requirements implies the provision of reliable technical information in a Project Design Document (PDD). Such CDM information requirements are mostly multi-disciplinary, require multiple sources, are complex, cumbersome, costly to establish, and beyond the scope of community capabilities (IPCC, 2000; Pfaff et al., 2000).Yet developing countries in which these projects are to be developed and implemented are known to be data scarce environments in very many domains (Quan et al., 2001; Dalal-Clayton et al., 2003). Moreover, few attempts at improving these CDM skills have been made at community level. This paper explores the use of Participatory-GIS in enhancing local knowledge validity as one route to abating the dearth in data and information for CDM project development. It specifically focuses on the use of local spatial knowledge relevant to the 'eligibility' conditions for land.

The UNFCCC draft tool for the definition of land eligibility for forestry projects allows for the use of information derived from Participatory Rural Appraisal (PRA) only in the instance where evidence is not obtainable from one of two other sources viz: (i) remote sensing i.e. satellite imagery or aerial photography; and (ii) ground based surveys- i.e. land registers, owners' register etc. But in many developing countries access to these kinds of information can be difficult and expensive (Dalal-Clayton et al., 2003). Hence, we judge that without some form of assistance, local communities will rarely be able to provide the first two options.

On the other hand PRA methods are not 100% reliable. PRA reliability suffers greatly if facilitation is not comprehensive enough and several biases could be introduced- e.g. wealth, gender, pro-literacy and other biases (Chambers, 1994). There is therefore need to develop more innovative, accessible, verifiable methods that enhance PRA and lift it out of the "second-best" rating attributed it by the CDM Executive Board. Our proposition is that Participatory GIS is one approach that can achieve this. Our study focuses on comparing local recall of forest evolution to satellite image classification of vegetation cover in order to assess the reliability of PGIS for CDM eligibility analysis.

More specifically this study explores the potential of PGIS in bridging the above gaps by answering two questions.

1. Can maps generated by combining PRA and GIS in PGIS compare to satellite images of land cover for eligibility in CDM forestry? And

2. What additional value could be obtained from using a PGIS approach as an alternative to the methods suggested by the CDM Executive Board decision?

The paper is organised as follows. Chapter 5.2 outlines the key conceptual issues of CDM forestry spatial information demands, indigenous/local knowledge and PGIS. Chapter 5.3 presents the methodological framework of the analysis and chapter 5.4 elaborates the study results. This is followed by the discussions and conclusions.

5.2 Conceptual background

In this section we sketch the relevance and dimensions of the key concepts under discussion in this paper, namely CDM forestry information requirements, local knowledge and Participatory GIS.

5.2.1 CDM Spatial Information demands

As mentioned in paragraph three, project proponents have to provide evidence demonstrating adherence to all CDM rules in a PDD. The information in the PDD is primarily the general project description, the situation of land and resource ownership and entitlements, the baseline methodology, duration of project activity/crediting period, a monitoring plan, calculations of greenhouse-gas removals, environmental impacts, and stakeholder comments (Lee, 2004).

A number of relevant project development information in the PDD could be represented spatially, these include

- The boundaries of the project area
- The situation of land and resource ownership and entitlements
- Justification indicating the project area was not forest prior to December 31 1989, or, has not been forested over the last fifty years (eligibility)
- The inventory plots and the comparison or control sites (additionality)
- Baseline evidence (current uses, state of forest, forest change history etc.) (additionality)
- Environmental impacts

For this study, we focus on the *eligibility* criterion to examine how PGIS could enhance local knowledge validity for carbon forestry as specified in the draft tool for land eligibility within CDM forestry.

5.2.1.1 Eligibility

Two aspects define forest eligibility for CDM. Firstly, the suitability of the forest within the definition of forest as provided by the host country, under Decisions 11/CP.7 and 19/CP.9 of the Conference of Parties. These decisions require countries to determine national threshold values of crown cover, tree height and minimum land area, which together will constitute the definition of a 'forest'. These decisions also provide ranges within which countries can choose which forests are eligible as follows; between 10 and 30 % for crown cover; 2 and 5 m for tree height; and 0.05 and 1 ha for minimum land area. These values have to be determined and communicated by the Designated National Authority to the CDM Executive Board.

The second eligibility condition refers to the type of forestry activity. Only afforestation and reforestation (AR) activities are eligible under the CDM during the first Kyoto commitment period (2008-2012). 'Afforestation' would mean planting trees on land that has been below all the threshold values (crown cover, tree height and minimum land area), as chosen by the host country for a period of at least 50 years. 'Reforestation' would mean planting on land that was below the threshold values on 31 December 1989.

The Procedures for defining the eligibility of lands for afforestation and reforestation project activities (Annex 16 of CDM Executive Board Report number 22) stipulate that in order to demonstrate that the two conditions above have been fulfilled, projects must supply verifiable information derived from one of the following sources:

a. *"Aerial photographs or satellite imagery complemented by ground reference data; or*

b. *Ground based surveys (land use permits, land use plans or information from local registers such as cadastre, owners register, land use or land management register); or*

c. *If options (a) and (b) are not available /applicable, project participants shall submit a written testimony which was produced by following a participatory rural appraisal methodology."*

The first two options are unattainable for most developing country communities because they are data scarce environments. A combination of poor and slow internet access, lack of computer technological resources and know-how, power supply problems, lack of foundation geographic data and high costs of data acquisition particularly of high resolution satellite images or field surveys in tropical dense forests, hamper the use of geographic information technologies in such rural communities (Gonzalez, 2000; Rambaldi and Callosa-Tarr, 2002; McCall and Minang, 2005).

5.2.2 Indigenous Knowledge

Indigenous knowledge is local knowledge unique to a given culture or society. It is the basis for local decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities. Such knowledge is passed on from generation to generation, in many societies by word of mouth (Warren, 1991 in Tripathi and Bhattarya, 2004). There is a consensus that "local", "indigenous", "community", "traditional" and "rural peoples'" knowledge concepts have many commonalities. The most important commonality being its localness in ownership and purposes. International policy documents such as Agenda 21 and the Convention on Biodiversity have recognized indigenous knowledge as a legitimate source of information for the enhancement of sustainable development (Quarie, 1992).

Although there is acknowledgement of the divide that exists between indigenous and scientific knowledge (Agrawal, 1995; Mathias, 1995), the epistemological and methodological similarities between 'local' and 'scientific' knowledge are recognised by many natural resource scientists (McCall, 2004; Johnson, 1997). Johnson (1992) distinguishes Traditional Environmental Knowledge and defines it as being "a body of knowledge built up by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of empirical observations about the environment and a system of self-management that governs resource use."

Brodnig and Mayer-Schonberger (2000), drawing from Johnson's definition, decipher a number of characteristics which are true of indigenous knowledge and also relevant for carbon management. These include, (i) that technical environmental knowledge / indigenous knowledge is in essence a geographical information system derived from and embedded in close relationship of local people with their land and natural resources, (ii) that the knowledge system functions like a distributed database, with members of the community serving as repositories for different types and categories of data, according to their experience and social status, (iii) it is a "scientific" system in that it consists of taxonomic structures, employs particular methodologies (e.g. oral histories) and relies on its own "experts".

McCall, (2004) adds two more important dimensions of indigenous knowledge. Firstly, ownership by local community, implying that it is connected with the local social priorities. It is therefore the main resource local people own and control whilst market forces appropriate other resources. Secondly, indigenous knowledge is more holistic because of its purposiveness. He also identifies a number of relative weaknesses of indigenous knowledge including, poor predictions under changed conditions, deficiencies in storage, transmission, communication and in quantifiable results.

Figure 5.1 identifies relevant local knowledge domains for CDM eligibility (in bold characters) based on the findings of Mathias, (1995). Biophysical factors and special plants could indicate the age of a forest especially in cases where plant species would only occur in secondary forests. In this instance oral narrations and recollections of historical evolution of forest cover are crucial for determining eligibility for CDM.

Poffenberger et al., (2002) reported the use of oral histories and recollection of forest cover by forestry staff and villagers, alongside forest department records to determine eligibility of forest for reforestation in Adilabad, India, because there was no remote sensing or ground survey data. They note that eligibility for Afforestation was more difficult as it required going back 50 years in an area where no maps or aerial photos were available.

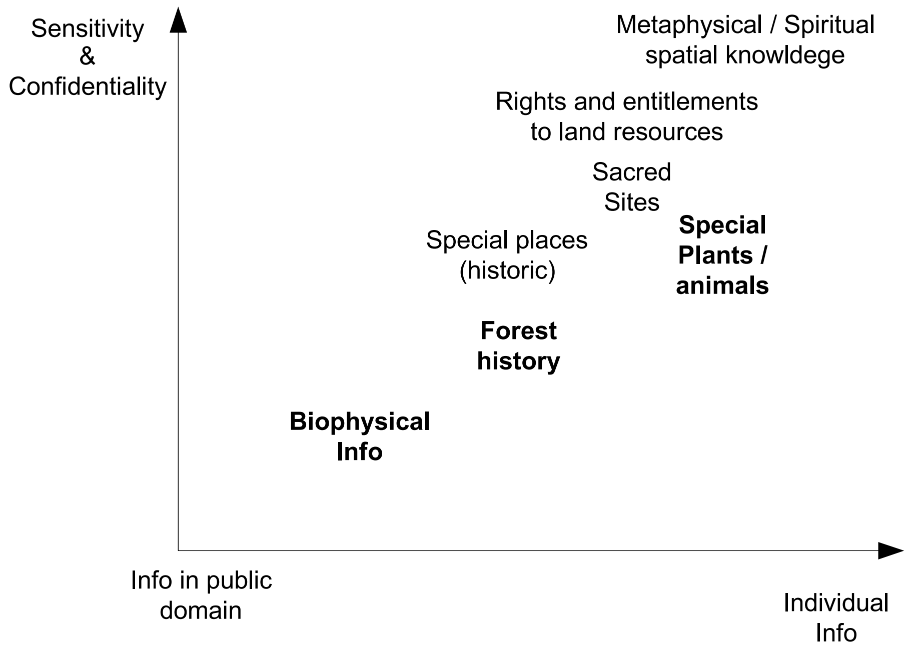

Figure 5.4 Local knowledge domains

5.2.3 Participatory Geographic Information Systems (PGIS)

Participatory Geographic Information Systems (PGIS) refers to a variety of approaches aimed at making GIS and other spatial decision-making tools more accessible and meaningful to local communities with limited technical resources (Schroeder, 1997 in Obermeyer, 1998). Jordan (1999) emphasises that PGIS is "the use of GIS in a participatory context". 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". PGIS developed as a response to criticisms from social scientists that criticised GIS as being top-down, complex and inaccessible as a tool designed to facilitate decision-making.

Applications of PGIS have been growing. The range of methods and techniques has evolved from sketch mapping through GIS displays, three-dimensional modelling, photo-mapping and mobile-GIS using PDAs, to multi-media applications for visualisations. Studies addressing indigenous knowledge and forest management have focused on local exploration of the potential of the approach in data collection, analysis and use (Lescuyer et al., 2001; Jordan, 2002; Kwaku-Kyem, 2002; Mbile et al., 2003; McCall and Minang, 2005). But few studies have attempted to use this approach in response to an externally demand-driven certification approach such as the CDM. It is this added value dimension that this study intends to explore.

The added value or benefits of PGIS have been approached from two angles, namely process and results or output. We will focus on the PGIS output dimensions to answer our second research question on the value-added of PGIS. The main dimensions would be accuracy (geometric, thematic and temporal); relevance (i.e. usability for eligibility conditions) and effectiveness (form, content and sharability). Details of its use can be seen in the results section. These dimensions are developed in Barndt (2002), which elaborates a model for evaluating PGIS programs. Key dimensions for results in his model are: appropriateness, accuracy, insightfulness and 'actionability' while dimensions of process include effectiveness, timeliness, replicability and efficiency.

5.3 The study area and methods

5.3.1 Study area

Our study area was the Bimbia Bonadikombo community in the South West Province of Cameroon. This community was chosen because of previous experience with Participatory GIS during the community forest acquisition process and their willingness to trial the PGIS procedure defined for the study.

The Bimbia Bonadikombo community is located at the foot of Mount Cameroon and borders the Atlantic Ocean. Part of the community is located on the fringes of Limbe (Victoria) urban community (see figure 5.5). Limbe and the surrounding areas have a population of about 123,900 inhabitants (RCDC, 2002). It is highly heterogeneous with few local people (of the Bakweri tribe). It is a complex of many villages namely, Mbonjo, Chopfarm, Banangombe, Bonabile, Dikolo, Mabeta, Ombe Native (Bamukong), Bonadikombo and several plantation worker camps. Forest extraction activities in order of importance include collection of non-timber forest products, fuel wood, timber, charcoal burning and hunting. The community has been managing a 3700 ha forest since mid 2002. Vegetation is evergreen with six different types, littoral vegetation, coastal bar forest, mangrove, freshwater swamp forest, stream and riverside vegetation, and lowland rainforest.

5.3.2 Methods

In order to investigate the potential of PGIS for enhancing the utility of local knowledge in providing CDM land eligibility information, we trialed an interactive process consisting of the following steps:

- Participatory Rural Appraisal; sketch mapping; transcription of indigenous knowledge and oral history in discussion groups;
- GPS surveys for local knowledge representation and GIS mapping;
- Satellite image interpretation; and
- Comparison of local knowledge of farm / forest frontier GPS points to maps derived from image classification.

We briefly present each step.

5.3.2.1 Participatory Rural Appraisal (PRA)

A combination of historical sketch mapping, historical time lines and oral history was used to provide evidence on the evolution of forest cover in the community forest area in Bimbia. Two groups were made of about 11 persons each. These groups first established the history of forest change through oral narrations, then each group made sketch maps of the extent of farm activity boundaries with forests for 1980 and 1990. Based on the discussions and the mapping, some key landmarks of the changes were identified. The communities themselves specifically selected the participants based on their knowledge of the forest and its history. Age was a critical factor in the choice of participants. In this exercise, we stayed within the PRA prescriptions of the draft tool for eligibility of land of the CDM Executive Board.

5.3.2.2 GPS Surveys

A crucial point in the PRA exercise entailed identifying specific points that could be located on the ground and corresponding to the 1980 and 1990 periods for GPS surveys. These points were used for a GPS survey covering 31 points marking the borders between farms and forests. 12 of the 31 points identified represented 1980, while 19 represented farm/forest boundaries around 1990. Based on the sketch maps, transects were designed to cover all the points. Point maps were thus produced for various periods from the GPS points collected. The idea of this survey was to move a step further from the PRA outputs into the realm of participatory GIS, given that the products from the process were a combined output from PRA and the use of geographic information technologies notably the GPS.

5.3.2.3 Satellite image interpretation / classification

The aim of the satellite image interpretation was to create comparable land cover maps from time series data of approximately the same period covered by the PRA and GPS surveys- i.e. 1980 and 1990. Maps of various years were important to enable a comparison of remote sensing data and community recall from the sketch mapping and GPS process. Two images were used, a Landsat

MSS image of November 27 1978 of four bands of between 72 and 82m resolution, and a Landsat TM image of December 31 1990 with 30m resolution for six optical bands and one thermal band with 120 m resolution.

Ground control points taken at road and river crossings were used to check the accuracy of the georeference of pre-processed images (georeferenced-WGS84 datum and ellipsoid, resampled and ortho-rectified) obtained from the USGS database. The Root Mean Square Error of the geo-referencing was 15.9 m. Visual interpretation of the images was enhanced through the use of linear stretching in the Integrated Land and Water Information System (ILWIS) software.

Prior to the fieldwork an unsupervised image classification was done in order to determine strata that are spectrally separable in order to plan ground truth data collection. Field surveys were carried out in January 2005 and a total of 173 ground sample points were collected for land cover in and around the community forest. It must be noted that we were analysing images of more than 20 years ago and therefore ground truth data collected in 2005 could not be completely applied. As a result industrial plantation estate maps were used to determine part of the historical ground truth alongside physical infrastructure landmarks from historical narratives. But this was limited to delineating plantation types and not other land cover classes. Training sets were delineated on the images by visual inspection of colour composites of bands 7-4-1 and 4-2-1 for the Landsat TM and MSS images respectively, in combination with field reference points. Between 42 and 900 pixels were included into the training samples for each class in the training phase.

A supervised classification was done based on the Maximum Likelihood classifier algorithm on both images. In this operation we assigned each pixel to a class. A majority filter was applied to the final classification maps. An accuracy assessment was done using a test-point set comprising part of the ground survey data reserved for the purpose and stratified random points assigned by visual interpretation based on expert knowledge. This made total test-point sets of 241 for the 1978 image, and 274 for the 1990 image.

5.3.2.4 Comparing local recollection and maps from image classification

In order to compare the results of local recall of land/ forest use by the people as recorded by GPS, against classified images of the corresponding period, an overlay operation and distance calculation were done in a GIS environment. The overlay allowed comparison of corresponding land cover class of the local knowledge pixel to see if they match. Distances to the nearest agricultural land use pixel was also determined for pixels when no positive match was identified.

A visual interpretation of point pattern distribution was also done with respect to land cover in both years.

5.4 Results

5.4.1 Participatory Rural Appraisal (PRA)

Relevant results from the PRA include sketch maps and narrative information with place names. Figure 5.2a and b show community recollection of the forest/farm frontier in 1980 and 1990 respectively. These points were identified based on extended discussions during the sketch mapping. In the process, the historical development of industrial agricultural plantations in the area was established. The foot paths into the forests served as mental transects while key events in the community marked historical evolution of land use. This led to the use of very specific names for point identification. Examples of point names included, “old coffee farm at carrefour kind-by-kind”, “aim bookshop’s farm” and “hill behind Chopfarm”.

5.4.2 GPS Survey

The GPS survey aimed at capturing geographic coordinates for the points identified and described during the PRA exercise. Figure 5.3 shows the 31 points recorded during this exercise, indicating the frontiers between farm and forest circa 1980 and 1990 respectively. These points form arcs that indicate the shapes and directions along which farms have been advancing into forests. The GPS survey exercise also served as confirmation for the PRA as one point was added and two points changed during the exercise.

5.4.3 Land Cover Classification

Figures 5.4a and b show the land cover maps of the Bimbia area for 1978 and 1990 respectively as derived from the image classification processes. In total 9 classes were identified. They include built-up areas, farms, secondary forests, dense forest, rubber plantations, palm plantations, mangroves and water. We also masked the clouds as a class in order to avoid or mitigate misrepresentation. It was difficult to differentiate between mangroves, secondary forests and rubber plantations in the 1978 image from spectral or texture characteristics, so we merged them into a single class of secondary forests. This could be due to the coarse resolution of the image (80m).

Built-up areas represent towns and villages; Farms are largely mixed cropping areas of between 0.5 to 1ha including food crops, cocoa, and other trees; Palm plantations are mostly industrial, albeit with a substantial number of smaller private plantations; Rubber plantations are largely industrial with tree heights

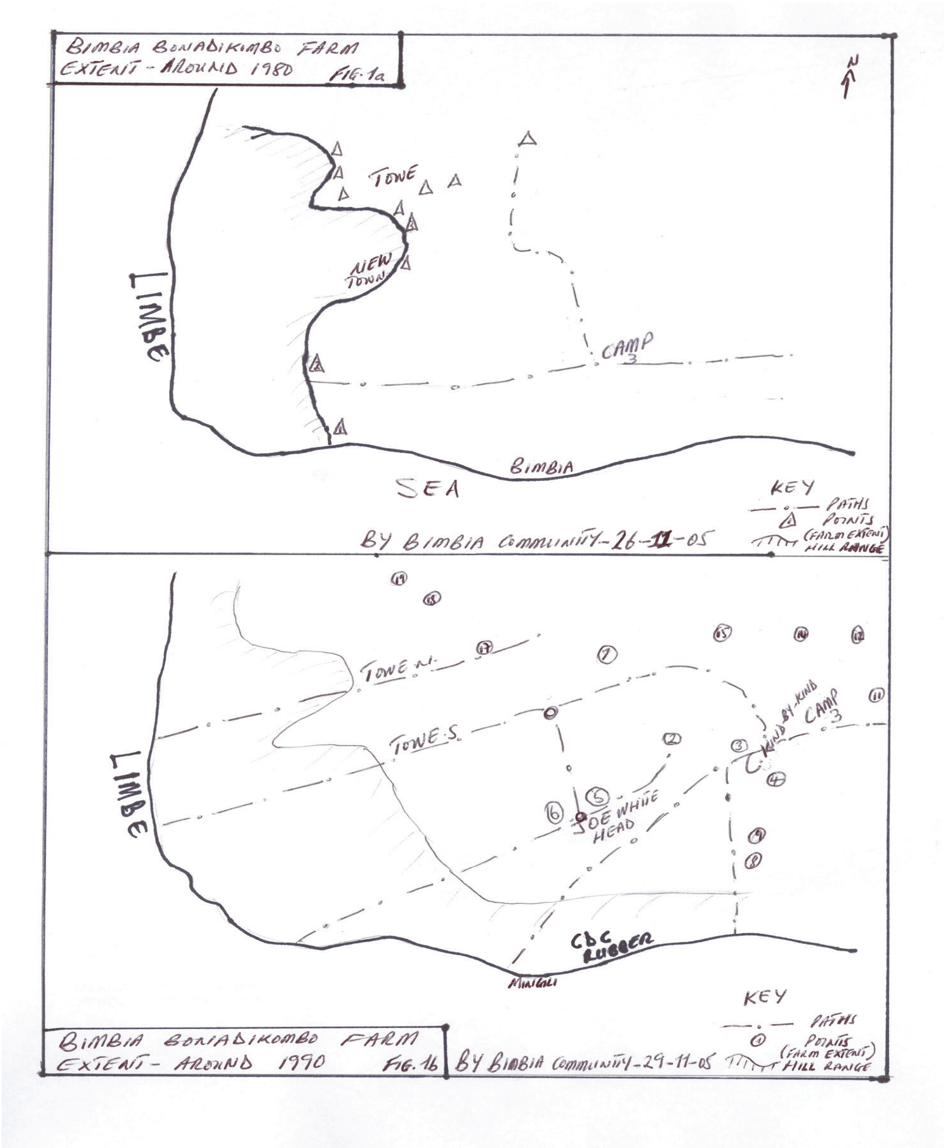

Figure 5.5 a & b Sketch maps of farm / forest frontiers for 1980 and 1990

of between 8 and 10m and canopy cover about 60% (same as palms); Secondary or Open forests comprises predominantly forests with hallmarks of recovery from human disturbance such as gaps, fallows of *chromolaena ordorata* and canopy cover of below 60%; Dense forest represents relatively less disturbed forests found mostly on very steep slopes with trees of between 10 to 40 m and canopy cover is generally above 60%. Mangroves are coastal wetlands dominated by *rhizohpora* species; and the class "unknown" we determined to be bare soils or cleared areas in 1978, especially as from oral history the large patches correspond to plantations and plantation development periods.

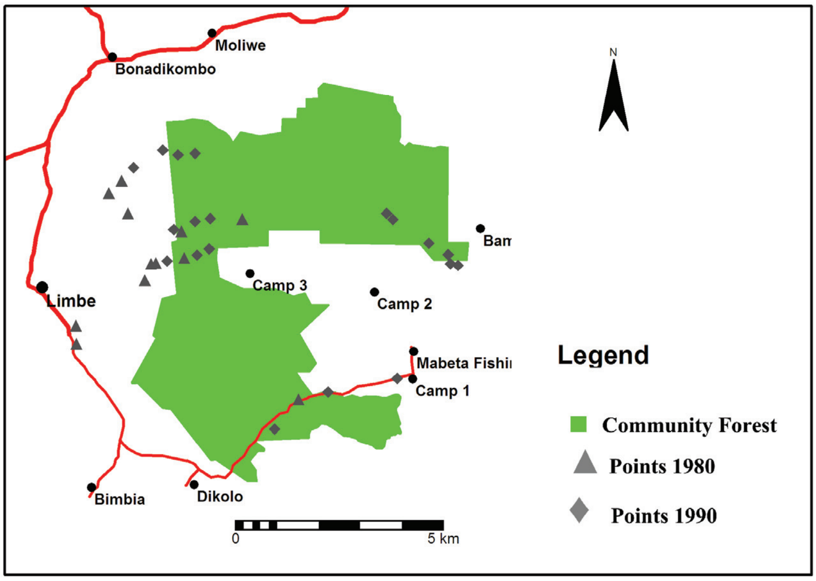

Figure 5.6 GPS survey points of farm -forest frontiers for 1980 and 1990

Tables 5.1a and b show confusion matrices of accuracy assessment and the kappa statistics for image classification. Overall accuracies of 85% and 81% for 1978 and 1990 respectively were recorded.

5.4.4 Local recall versus land cover maps

Figures 5.5a and b show an overlay of the point maps for 1980 and 1990 over the land cover maps from images of 1978 and 1990 respectively. It reveals that the arcs/patterns formed by the points of 1980 and 1990 fairly correspond to the directions of and patterns of change in land cover between the said periods. The point patterns also confirm that farm expansion occurs largely along paths and roads leading to the forest.

Table 5.9a & b Accuracy assessment of supervised classification of 1990

		Reference Data									
		Ba	Df	Fm	Mg	Pp	Rp	Sf	Wt	Total	User's Accuracy
Map Class	Ba	35	0	0	0	0	0	0	0	35	1.00
	Df	0	28	1	0	0	0	3	0	32	0.88
	Fm	0	0	32	0	0	0	0	0	32	1.00
	Mg	0	1	3	31	0	0	0	0	35	0.89
	Pp	0	3	3	0	21	0	6	0	33	0.64
	Rp	0	0	2	0	0	24	0	0	26	0.92
	Sf	0	8	1	1	6	0	17	0	33	0.52
	Wt	2	3	8	0	0	0	0	35	48	0.73
	Total	37	43	50	32	27	24	26	35	274	
	Producer's Accuracy	0.95	0.65	0.64	0.97	0.78	1.00	0.65	1.00		

Average accuracy= 82.06%; Overall accuracy= 81.39%

NB: Ba= Built-Up area; Df= Dense forest; Fm= Farms; Mg= Mangroves; Pp= Palm plantations; Rp= Rubber plantations; Sf= Secondary forests; and Wt = Water

5.1 (b)

		Reference Data								
		Ba	Df	Fm	Sf	Pp	Uk	Wt	Total	User Accuracy
Map Class	Ba	42	0	1	0	0	0	0	43	0.98
	Df	0	25	0	2	2	3	0	32	0.78
	Fm	0	0	32	0	0	0	0	32	1.00
	Sf	0	13	0	19	3	0	0	35	0.54
	Pp	0	0	0	7	26	0	0	33	0.79
	Uk	0	0	2	0	0	22	1	25	0.88
	Wt	0	0	1	0	0	1	39	41	0.95
	Total	42	38	36	28	31	26	40	241	
	Producer Accuracy	1.00	0.66	0.89	0.68	0.84	0.85	0.97		

Average accuracy= 84.57%; Overall accuracy= 85.06%

NB: Ba= Built-Up area; Df= Dense forest; Fm= Farms; Pp= Palm plantations; Sf= Secondary forests; Uk= Unknown; and Wt = Water

More importantly, a pixel-by-pixel comparison revealed that 51.6% (n=31) of the points identified and mapped during the PRA and GPS survey for 1980 and 1990 were positively classified as farms or plantations in both years. The remaining points were located at varied distances from farms as follows: 19.3% (6 points) at ≤50m; 3.2% (1 point) at 58m; 12.9% (4 points) at 100-200m; and 12.9% at >200m.

5.4.5 Value-added of PGIS to local information

Table 5.2 summarises the value added to local knowledge for CDM land eligibility observed during this study.

Table 5.10 Value added of PGIS use in Bimbia Bonadikombo

Dimensions	Value added by PGIS	PRA representation	Local Knowledge Characteristics
Relevance			
Verifiability	Made oral-historical data verifiable using other 'scientific' methods	Visually indicative but not comparable or scientifically acceptable / verifiable	Oral narratives
Representa-tiveness	Introduced geographic representation where none existed before	Diagrammatic visual representation only	Previously unrecorded mental maps
Effectiveness			
Form	From oral to geometric scaled digital data	Sketch maps not often drawn to scale	Oral /mental map form
	Measurable (distances, areas)	Little or no measurements possible	Perceptual estimates of distance and area
Sharability	Possible digital storage, retrieval and sharing through digital media	Mostly limited to physical transfer media (Paper / models)	Limited to oral communication media
Accuracy			
Geometric	Improved using coordinates	Limited to shapes and ground markers (symbols)	Mental markers, cognitive landmarks
Temporal	Not evident	Perhaps better in developing countries where no geographic data exists	Goes back even longer in time than any technology
Thematic	Not evident	N/A	N/A

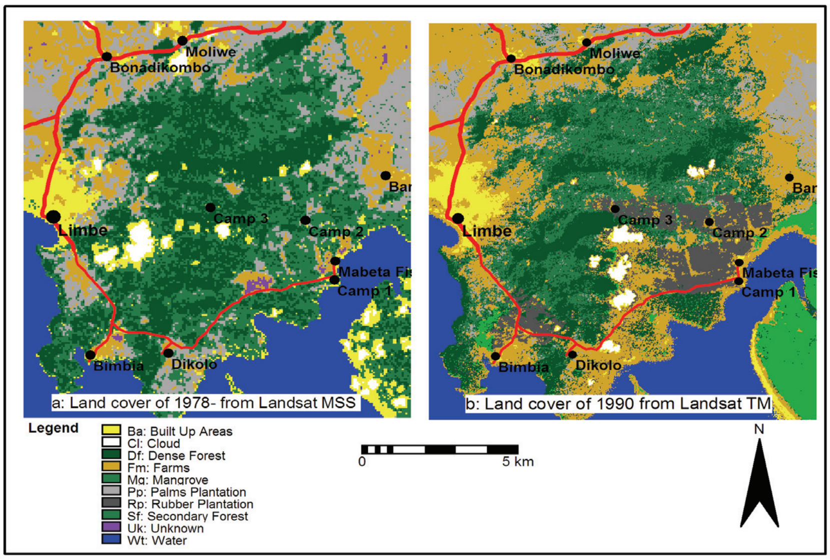

Figure 5.7 a & b Land cover maps of 1980 and 1990

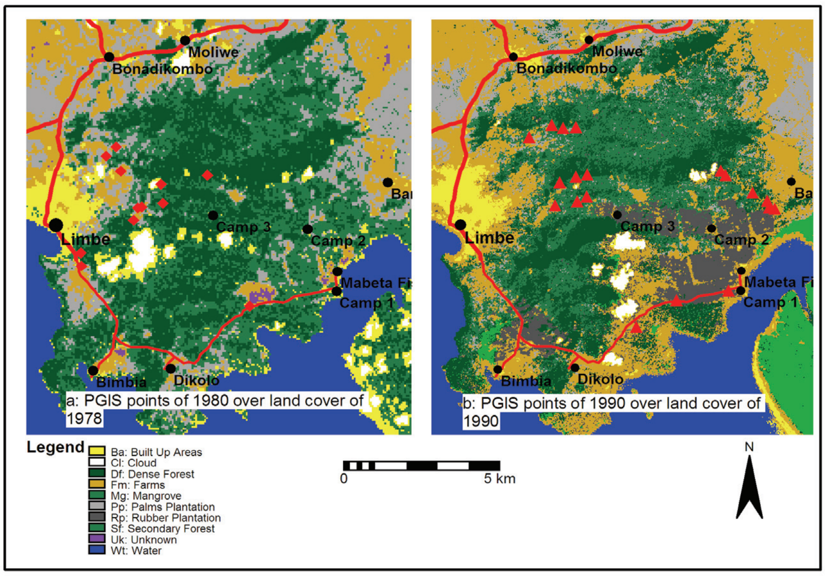

Figure 5.8 a & b Overlay of PGIS points and land cover for 1980 and 1990

5.5 Discussion

This study explores the potential of PGIS to complement the UNFCC recommended methods for providing evidence for land eligibility for CDM forestry projects; this is important because many developing countries are likely to find some of the requirements inaccessible. The first question addressed regards the extent to which PGIS evidence compares with that from remote sensing, principally satellite images.

From visual interpretation, we observe a good fit between georeferenced PRA points of farm/forest boundaries of 1980 and 1990 (see figure 5.5a and b). The trajectories and directions of land use / forest change shown by the points match those indicated by the image classification. However, on a pixel-by-pixel basis, 51.6 % of the points were classified as farms or plantations. This is much lower than expected, as previous studies comparing local knowledge and scientific knowledge have shown stronger comparability and reliability. Examples include soil classification studies -see Barrera-Bassols, 2003; vegetation classification- e.g. Naidoo and Hill (2006); perceptions of biological value or importance – e.g. Brown et al. (2004); and resource trends- e.g. Hillier et al., (1999). It has to be noted that these studies were dealing with actual taxonomic issues as opposed to mental recall addressed in this study. Mental recall is unlikely to have been subjected to as much testing as local taxonomy of soils and vegetation and could well be affected by the mental state of the participants during the recall activities.

However, 19.35 of the points not classified as farms or plantations were found to be <50 m away from pixels classified as farms along the same arcs of georeferenced PRA points. Given that average farm sizes in this area is between 0.5 and 1ha, a spatial resolution of 80m pixels for the 1978 image could account for the loss of small farms in the classification process, especially with the application of majority filters. More so, given the error margins of the Garmin etrex GPS used in this study, and the difficulties encountered with their use in forest areas, positioning errors could have been introduced. Another reason for the difference could be the two-year gap between the image and the approximate PRA period of 1980 used. Taking these factors into account, we could consider the chance that the match could easily be about 70%.

On the other hand, uncertainty and imprecision in farm or land use identification during recollection could also have contributed to the huge difference. For example, an average farm in the Bimbia area is cleared over a 2-3 year period, hence in small progressive bits. This means that only small patches are cleared in the first year and canopy cover remains relatively high in that year. It is therefore possible that such an area of high canopy could be classified as primary forest. We must consider the difficulties of remembering and specifying the precise phases of farm clearing back to the 1980s; these historical recollections being discussed during the transect walks. Such an issue should be given more attention in future exercises.

It could be argued that other PGIS methods such as photo-mapping (Alcorn, 2000; Jordan, 2002) could more directly help improve PRA as it would be based on interpretation of forest texture and would directly georeference the points identified during interpretation and tracing on aerial photos. But aerial photos are often not available in developing countries. When available, they are very expensive and perhaps not at scales usable for PRAs. In the case of Bimbia, aerial photos available at the Institut National de Cartographie (National Mapping Agency) were those of 1950 (at scale 1:20000) at a cost of 5000 XAF (USD 10) per photo. Bimbia would need more than 50 such photos, plus additional cost to enlarge them to scale 1:5000 in order make them appropriate for use at community level (Groten, 1997). Furthermore, for CDM eligibility these photos were not useful, because oral history had revealed that the forest could not qualify for Afforestation because the entire area was forest by 1960. What was needed were photos of around 1990 which were not available.

The second question posed in this study is, what value the use of PGIS could bring to the CDM eligibility evidence requirements. Table 5.2 summarises the value added elicited in this study. A key finding is that PGIS offers an opportunity for connecting PRA evidence with remote sensing rather than the "either or" option offered by the CDM Executive Board in the draft tool for land eligibility. By bringing in the GPS and georeferencing the sketch map points, an opportunity was created to enable further use of the local knowledge in a GIS environment. This can help the validation process- given that the operational entity could have access to remote sensing data and therefore confirm the eligibility claims. This could serve not only land eligibility determination, but also wider CDM forestry mitigation estimation and monitoring processes if and where local resources and skills allow for the use of geographic information technology.

For example, during the development of the Scolel Te carbon agroforestry project in Chiapas, Mexico, farmers used sketch maps to elaborate individual farm carbon sequestration plans called "planes vivo". Experts used these to work with and support them in the project while the Fund for Forestry Finance (FONAFIFO) provided funds for the purchase and use of remote sensing data for monitoring by NGO experts (ECCM, 2000; Subak, 2000). In this instance, PGIS can be very helpful as a tool to directly link the "Planes vivo" to the image or a geographic information database. Having an affordable geographic information tool such as a GPS can enable georeferencing of local knowledge.

Another example of value added by PGIS, is the change in form of local knowledge from oral to hard and digital information. In our experience, knowledge elicited by way of PRA in terms of the farm /forest frontiers, forest tenure and use rights and others relevant for CDM planning were converted into digital format. This brings new possibilities for sharing knowledge with other actors and better information availability for future decision-making (Minang and McCall, 2006). In such data-scarce environments, this constitutes a huge step for planning and information management.

This study also indicated that beyond the interconnection, PRA and Image analysis are actually interdependent kinds of evidence. Though satellite images are increasingly more available, we learnt that reliable interpretation of satellite images of a distant past requires local knowledge about changing land uses. One of the most robust ways for getting this is PRA. We interpreted images dating back 28 years, meaning we needed land use maps of that period for ground truth data. Like in most developing country settings, this was not available. We thus explored 1975 topographic sheets of the area, plantation survey sheets and PRA knowledge to develop part of the sample training and test sets for image classification. We therefore argue that CDM rules should not see PRA as only second best evidence, or a replacement, in cases where satellite image data or aerial photos are not available. They should rather be seen as complementary.

5.6 Conclusions

Local spatial knowledge is a repository that data poor developing countries can draw from in order to meet resource and environmental management data and information demands. Yet, the characteristics of local knowledge present drawbacks for acceptability within forest services certification schemes such as the Clean Development Mechanism of the Kyoto Protocol. This study experimented with the use of participatory GIS for improving the reliability and validity of local spatial knowledge with regard to CDM forest eligibility within the Kyoto Protocol. It examined whether or not PGIS produced maps could compare to remote sensing data and whether or not any value could be added to local knowledge in the process.

Evidence from our study was only “moderately convincing” of the comparability of PGIS produced maps to remote sensing derived land use maps. But it found good potential for improvements in local spatial knowledge for CDM eligibility justification using PGIS. Improvements in both the PGIS tools and remote sensing analysis would be required to fully exploit this potential. Some of the possible improvements are highlighted in the preceding section.

PGIS was found to add value to local knowledge that could otherwise not be possible with PRA only (see Table 5.2). It allowed for possibilities to georeference local knowledge and therefore make it digital and usable in geographic media with greater possibilities for storage, updating, retrieval, analysis and sharing among actors.

We have also highlighted that PRA and remote sensing are rather complementary in terms of providing evidence for CDM land eligibility, hence should be considered as such, and not simply as replacements as is currently required by CDM rules. We encourage other researchers and planners of carbon forestry projects to further explore PGIS alternatives to providing CDM project validation and certification evidence, as they can be more valuable, appropriate and practical for data scarce and technically-poor developing country environments.

Chapter 6
Participatory GIS as a vehicle for community carbon forestry governance*

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And

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Abstract

There is growing claim in literature that community forest management models can meet the triple objectives of conservation, development and the mitigation of carbon, thus in principle fulfilling the requirements of the Clean Development Mechanism (CDM). But attempts at initiating afforestation and reforestation projects at community level have been fraught with difficulties relating to the dynamics and intricacies of common property regimes, and land and resource tenure issues that bring serious complexities into rule making, decision-making and implementation. This often means higher negotiation costs and perhaps greater risk of project failure, compared to private or government owned projects that have simpler management structures, more resources and manpower. This study explores the potential for promoting local governance in community carbon forestry using participatory GIS. It reviews ongoing community forestry PGIS process that included carbon planning activities for exploratory purposes in Bimbia Bonadikombo, Cameroon. The analytical framework looks at participatory spatial planning performance with respect to key dimensions of good governance, especially the intensity of community participation and empowerment, equity within communities, respect for indigenous knowledge and rights, ownership, legitimacy, and effectiveness in responding to carbon planning requirements. The study found that the participatory GIS and participatory mapping processes contributed – positively, though not comprehensively - to good governance while simultaneously meeting the information requirements for carbon forestry under the CDM. It contributed to good governance, by improving dialogue, legitimising and using local knowledge, some redistribution of resource access and control rights, and empowerment of local community groups by means of new skills training in geo-information technology. PGIS also produced relevant evidence for the CDM criteria such as land eligibility, project boundary, baseline development (i.e. additionality) and land ownership and entitlements. Furthermore, it brought forward vital information relating to conflicts, equity and gender, and information management that could influence CDM project validation and certification, leakage and risks.

Key Words: Cameroon, Participatory GIS, Good Governance, Community Carbon Forestry, Clean Development Mechanism

6.1 Introduction

There is growing consensus in literature that community forestry models can meet the triple objectives of conservation, development and the mitigation of carbon, thus in principle, fulfilling the requirements of the Clean Development Mechanism (CDM) (Klooster and Masera, 2000; GEF, 2000). At present, only a limited range of forest interventions- afforestation and reforestation, are eligible under the CDM, and attempts to initiate such projects at community level have been fraught with difficulties relating to, the dynamics and intricacies of common property regimes, and land and resource tenure issues that bring serious complexities into rule making, decision-making and implementation. This exposes community carbon forestry to potentially higher negotiation costs and perhaps greater risks of failure (de Jong et al., 2000; Smith and Scherr, 2003). On the other hand, most of the current CDM forestry projects are private or government owned, having simpler management structures and often better resources and manpower. As a result, little attention has been paid to enabling poor communities benefit from the opportunities provided by the CDM.

Good Governance approaches are needed to support community forest management planning and implementation for environmental service provision and carbon forestry uptake and project development. Such approaches must be grounded in participation and capable of enhancing consensus building, equity, compliance and effectiveness (Corbera, 2005; Poffenberger, 2002; Smith and Scherr, 2003). An example of such approaches used in enhancing community based natural resource management governance is participatory-GIS (Alcorn, 2000; McCall and Minang, 2005; Rambaldi et al., 2006a, b). However, its applicability in the realm of carbon forestry has not been tested.

This study explores the potential for promoting local governance in community carbon forestry using participatory GIS. It reviews an ongoing community forestry PGIS process that incorporated carbon-planning activities for exploratory purposes in Bimbia Bonadikombo, Cameroon. In the following sections, we introduce the CDM and a good governance criteria and indicator framework for community carbon forestry governance assessment. We assess the application of PGIS in a community forest management project in Bimbia Bonadikombo, Cameroon, by employing key dimensions of good governance. It ends with a discussion of salient issues in PGIS processes that should contribute to well-governed carbon forestry.

6.2 Clean Development Mechanism Forestry

The CDM is one of three “flexible mechanisms” in the Kyoto Protocol designed to accomplish the objectives of the UNFCCC. It makes provision for investment by industrialised countries and industry in projects related to carbon emissions reduction and carbon sequestration in developing countries. These projects should contribute to sustainable development in developing countries (i.e. Non-Annex 1 countries) while enabling developed countries (i.e. Annex 1 countries) to meet the Kyoto emission reduction and quantified emission limitation targets (Art. 12.2 of the Kyoto Protocol).

CDM projects are expected to fulfil a set of requirements prior to the issuance of certified emission reductions by the CDM Executive board. These requirements are articulated in the Kyoto Protocol and in subsequent decisions taken during the Conference and Meetings of Parties – i.e. mainly in Decisions 19/CP.9 and 14/CP.10 and the Marrakech Accords (Lee, 2004). These requirements can be summarised under the following categories: eligibility, additionality, acceptability, externalities and certification.

6.2.1 Eligibility

Afforestation and reforestation (A/R) are the only forestry activities eligible under the current CDM rules for the first commitment period (2008-2012). Afforestation would mean planting trees on land that has not been forest for a period of at least 50 years (i.e. according to the host country definition of forest). Reforestation would mean planting trees on land that was not forest on 31 December 1989.

6.2.2 Additionality

Sequestration or emission reductions due to the project activities must be "additional" to any that would occur in the absence of the project or under "business as usual" (Paragraphs 18-22 of Decision 19/CP.9). In other words, additionality implies that projects must result in a net storage of carbon and therefore a net removal of carbon from the atmosphere.

6.2.3 Acceptability

The Kyoto Protocol states that all carbon offset projects in developing countries are required to contribute to sustainable development (Article 2.1 and 12.2). Host countries have to have criteria for sustainable development by which projects will be judged. In addition, projects must be consistent with other international agreements and guidelines such as the Convention on Biodiversity, Agenda 21, Ramsar and others. See also (Lee 2004) and Olhoff et al., (2004).

6.2.4 Externalities (Environmental Impact and Leakage)

Projects must demonstrate a clear strategy for dealing with all socio-economic, cultural and environmental impacts/effects that may arise from project implementation, including how the negative impacts would be mitigated or countered. Project analysis must also show how they will address possible unplanned emissions that could occur outside project boundaries as a result of project activities (known as leakage). I.e., how leakage has been estimated and what measures will be put in place to minimize it.

6.2.5 Certification

The concreteness, measurability and long-term characteristics of the project will have to be checked independently by a third-party (i.e. a Designated Operational Entity) accredited by the CDM executive board. This takes place in two main stages during the CDM project cycle namely validation and verification. These processes enable project registration and the issuance of Certified Emissions Reductions (CERs) respectively.

Project developers are required to provide evidence on the above-mentioned criteria in order to be approved at the national level and at a later stage certified by the CDM Executive Board. This evidence is submitted in a Project Design Document (PDD). Lee (2004) summarises the PDD information requirements as including:

General description of project activity; situation of land and resource ownership / entitlements; baseline methodology; duration of project activity/crediting period; monitoring methodology and plan; calculation of GHG removals within project boundaries; environmental impacts; stakeholder comments; contact information on project participants; information regarding public funding; new baseline methodology; new monitoring methodology; and table of baseline data. However small scale projects do not need to develop new methodologies, as they are required to apply one of the approved small scale methodologies.

The planning and project development process that enables project registration and eventual acquisition of certified emission reductions involves multiple-actor interaction and decision-making, hence, requiring careful coordination and management. More actors may imply more complicated negotiations and higher transaction costs. Landell-Mills and Porras (2002) show that transaction costs can be greatly reduced by developing projects in communities where local organizations are already active and participatory development processes are in place.

6.3 Participatory GIS, good governance and CDM forestry

The analysis in this paper is based on a set of characteristics and dimensions of good governance (see figure 6.1) which incorporate prescriptive objectives and initiatives to strengthen civil society in order to make the governing more accountable, more transparent (open policy-setting and decisions), responsive, and effective. Thus we follow the more progressive goal-directed interpretations of good governance of say, OECD, (2001) and UNDP, (1997). Accountability, legitimacy and effectiveness therefore are interpreted as the means towards political-ethical higher values of: strengthening legitimacy of the governing, empowering the governed especially the marginalised, creating respect for rights, ensuring ownership (of geo-information) emphasising equity, and reinforcing competence in dealing with i.e. geo-information.

Participation is a key element among the criteria of 'good governance' for effective participatory spatial planning. Governance is a set of measures of the relationships between the *governed* (civil society and the public) and the *governing* (the government, its institutions, and private sector interests). The pertinent power *relationships* are those involving policy setting, decision-making, planning and implementation. Core concepts for understanding governance are accountability - closely related to legitimacy, and effectiveness, and within those are contained categories such as lawfulness and subsidiarity and inclusion (or participation). But, *good* governance is hard to define unambiguously, since it introduces relativist political and ethical categories and priorities. – the prescriptive contextual questions are: accountability for what types of actions?, legitimacy for what ends?, effective for whose purposes? See discussions in, for example: Aubut (2004), Goetz & Gaventa (2001), OECD (2001), UNDP (1997) and Béné and Neiland (2006).

The dimensions of good governance employed (figure 6.1) are based on analysis of two decades of PGIS and P-mapping applications in natural resource management as expounded in McCall and Minang (2005). We thus concentrate on establishing the link between the good governance criteria and CDM forestry in view of the case study.

PGIS, good governance criteria and the CDM can be linked through an analysis of the interactive process that would enable CDM forestry project certification. Firstly, a number of key CDM forestry data requirements could be best provided in spatial (geographic) format. These include,

- The boundaries of the project area (Project description/ Leakage)
- The situation of land and resource ownership and entitlements (barrier analysis in additionality)

- Justification indicating the project area was not forest prior to December 31 1989 or has not been forested over the last fifty years (eligibility)
- The inventory plots and control sites (Baseline / Additionality)
- Baseline evidence (Current uses, state of forest, forest change history etc)
- Environmental Impacts

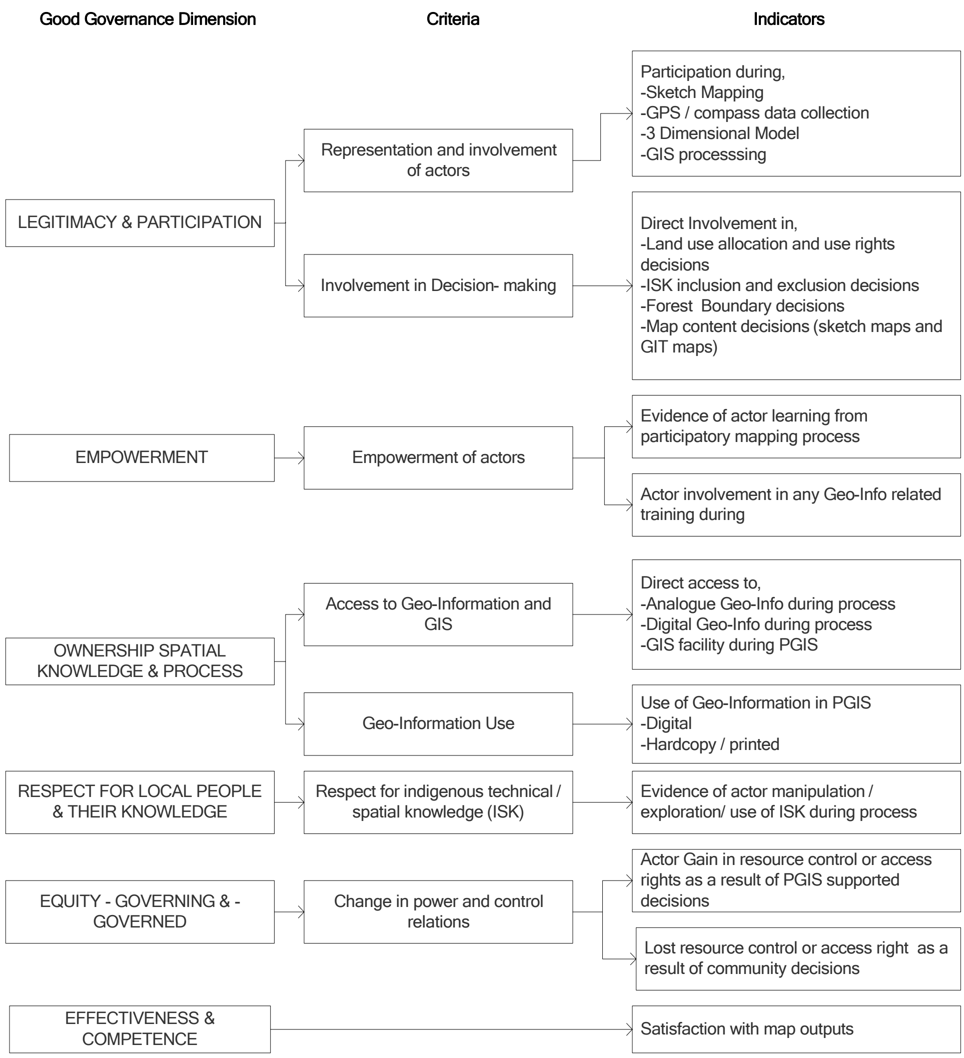

Figure 6.9 Good Governance criteria and indicators used in this study -Adapted from McCall and Minang (2005)

Given that these developing countries are data scarce environments (Quan et al., 2001; Dalal-Clayton et al., 2003), these data will have to be generated locally in most cases, and by methods that optimise local knowledge use and scarce resources. This makes the participatory GIS process suitable as it combines traditional PRA methods and accessible GIS tools (Rambaldi et al., 2006a, b). The map outputs must satisfactorily represent carbon forestry information and other forest management objectives to be effective; see effectiveness and competence dimension of governance in the framework in figure 1.

Secondly, issues such as project boundaries or which community lands to include, the types of land uses to adopt for carbon sequestration and emission reduction have to be decided in the participatory-mapping process. The participation of all stakeholders is imperative in these instances if agreement has to be reached and if the project is to prevent conflicts emerging from any such decisions. Participation is likely to vary in terms of intensity and by type (see examples of participation ladders by Arnstein 1969, McCall 1998, Catley 1999, Carver 2003). These arguments are reflected in the Legitimacy and participation, empowerment dimensions of governance in figure 6.1.

Thirdly, information is needed for informed decision-making. We reckon that in the participatory GIS process various kinds of geographic information will be used to facilitate decision-making. Hence, the use of more and better quality information is likely to facilitate participation and decision-making. In the set of good governance criteria use in this study, we adopt and adapt a geographic information use categorization by Craig and Elwood (1998). These aspects of community carbon forestry are represented in the ownership of spatial knowledge and respect for local people and their knowledge dimensions in the governance criteria and indicators employed in this study.

Finally, employing participatory GIS in the planning of carbon forestry may impact on the livelihoods of parts of the community. Issues of rights and entitlements to land and resources are bound to occur when land use decisions are made. For example, if communities decide to adopt reforestation as a carbon sequestration or emission reduction strategy, rights to clearing and farming or wood harvesting may be restricted in the forest areas involved. This affects power and could take a gender dimension- differing between men, women, or other groups. These shifts in power may or may not result in conflicts depending on the participation of these groups in the land use decision-making. These are accounted for in the equity dimensions of governance.

These variables are very often interconnected in reality. But we initially separate them to enable us to decipher issues that would otherwise be diluted in more complex analysis. More relevant and holistic analysis of the salient carbon forestry issues is addressed in the closing sections of the chapter.

6.4 Participatory GIS in community carbon forestry in Cameroon – a case study

This section assesses a recent participatory GIS experience from Bimbia Bonadikombo (herein after called Bimbia) Community Forest (CF) in Cameroon, using good governance criteria and indicators. The research critically looks at the participatory GIS process, seeking to answer the questions whether or not, and how, participatory GIS experiences in Bimbia have promoted good governance. The policy provisions for Community Forest planning in Cameroon are first introduced.

6.4.1 Community forestry policy management and geo-information

The Cameroon Government's forestry management reforms resulted in a 1994 environmental law that introduced inter alia the concept of community forest. Community forest is defined therein as: 'that part of non-permanent forest estate (not more than 5000 ha.) 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' (MINEF, 1998). The aims of the introduction of community forests were to enhance local governance through community participation, to integrate indigenous forest management practices, to provide direct economic benefits to communities, and to improve forest / biodiversity conservation.

The procedures of the Cameroon Ministry of Forests and Fauna (MINFOF) prescribe the following geo-information needed for granting a community forest:

- Map showing boundaries of the intended community forest (Also relevant for CDM project boundary)
- Clear description of activities previously carried out in the proposed Community forest area (Also relevant for CDM land eligibility and baseline determination).
- Inventory report of community forest resources (Relevant for baseline and additionality).
- Final Management Plan, zoning the forest into compartments (Relevant for Baseline and additionality).

In the last few years the community forestry constituency has been growing. By January 2006, the ministry had received 334 applications for community forest. International donor and NGO interest has also grown since the promulgation of the community forestry law. Many communities, with NGO support, have been able to incorporate the use of GIS and geographic information technology to fulfil the geo-information requirements (MINEF, 2003; Minang, 2003; Ekwoge et al., 1999; Lescuyer, 2002). These experiences qualify as a form of participatory-GIS, given both the use of Participatory Rural Appraisal and participation methods, and the involvement of people in standard GIS tools.

6.4.2 The Bimbia Bonadikombo community

Bimbia Bonadikombo in the South West province of Cameroon is located along the coast and at the foot of mount Cameroon at 3 58 24N and 9 13 44E. It is a complex of six villages and a number of plantation camps. Bimbia, Dikolo, Bamukong (Ombe Native), Mbonjo and Chop farm are typical rural settlements, while Bonabile, Bonangombe and Bonadikombo are located on the fringes of Limbe town. The community has a high tribal diversity with only a few people of the local Bakweri tribe. Some residents also work for a state owned industrial plantation corporation called Cameroon Development Corporation. About 1000 farmers are estimated to be farming in the community forest. About 50% of the community forest is farmland - i.e. cocoa, oil palm and rubber plantations. Many often combine farming, fishing and forest product harvesting for a livelihood. Charcoal, timber, fuel wood and NTFPs are the principal forest extraction activities.

Given the diverse tribal origins of the population, traditional forest management control; became difficult, giving rise to indigenous organizations that wanted to enforce local control prior to the establishment of the community forest.

The community began planning for a community forest in 1996 with support from a multilateral cooperation initiative known as Mount Cameroon Project and MINFOF. A management agreement was signed with government in March 2002. Between March 2004 and January 2006 our study introduced a series of PGIS processes aimed at integrating carbon into the management of the Bimbia community forest.

Actors: The current distribution of roles and functions and diverse interests of the multiple actors in the Bimbia context is important for understanding forest governance. The *Bimbia Bonadikombo Natural Resource Management Committee-(BBNRMC)* represents and organizes the community in community forest activities while the *Chiefs* remain the custodians of the forest with all customary powers to authorise and monitor resource access. The *local MINFOF staff* is supposed to assist communities technically in community forest management as well as oversee the management plan implementation, but they are often inadequately staffed and lack resources. *Forest User groups such as farmers, timber exploiters, charcoal burners and fuel wood harvesters* are very important in sharing their knowledge with the community in the planning process, and as such are key players in the demarcation, mapping and inventories. They however need to be assured of access rights within the community forest. *Women* as a group, like farmers, participate in many community forest-planning activities and are particularly concerned with access rights to non-timber forest activities. *Mount Cameroon Project* facilitated the planning process, providing access to finance, technical knowledge, geo-information technology, lobby and facilitation skills, and links with partners outside the community. Other stakeholders playing roles in conflict resolution and political support to the process include *The Limbe Urban Council* and the Bimbia *elite* living in other parts of the country.

6.4.3 The participatory GIS process in Bimbia Bonadikombo

The participatory GIS process in Bimbia can be divided into five main phases - the preparatory, land use mapping and planning, community forest boundary mapping, the community forest management plan mapping phases, and the carbon feasibility phase. The preparatory phase was aimed mainly at the Ministry's Forest Plan at national, regional and local levels to see if forests in the area are eligible for community forestry based on the provisions of the 1994 forestry law. In order to designate part of the local forest area as a potential community forest, the community must proceed through a sort of land use mapping and planning process as in phase two. The designated area was then demarcated and the boundaries mapped, in the third phase. The fourth phase constituted planning and mapping the forest into forest management zones. The last phase involved specific carbon feasibility analysis, including tenure mapping, historical mapping and carbon scenario analysis. A summary of the phases is presented in Table 6.1; Figures 6.2 and 6.3 can also be interpreted as work flowcharts. The process can be characterised as learning by doing over an eight-year period. It should therefore not be interpreted as uni-linear; the tabular rendition is a simplification for presentation purposes, because in reality there was a good deal of iteration.

6.4.4 Research methods in the case study

The first step in the research was to identify relevant, reliable and valid criteria and indicators for Participatory-GIS enhanced community carbon forestry governance. We adopted and adapted a set of good governance criteria for a similar process by McCall and Minang (2005) - see figure 6.1.

Table 6.11 Participatory GIS process in Bimbia Bonadikombo

PHASES	I. Preparatory Phase	II. Land Use Mapping	III. Community Forest Boundary Mapping	IV. Management Plan Mapping	V. Carbon Feasibility
ACTIVITIES INVOLVED	Stakeholder analysis; PRA; baseline survey; Socio-economic studies; conflict analysis	Sketch mapping; Reconnaissance visits; Negotiations; Land use planning	Ground boundary survey and confirmation; GPS (by villagers); GIS (by Mt. Cameroon Project)	Participatory forest inventory; Review of plant animal information; Meetings; GPS surveys	Sketch Mapping; transect walks; GPS surveys; GIS mapping (researcher); Carbon Scenario analysis
ACTORS	Chiefs; Mt Cameroon Project; Ministry	User groups (farmers, charcoal burners, timber exploiters etc) Mt Cameroon Project; Ministry; chiefs; CDC; VLFCC; LUC; VACIG	Village and Forest User group representatives; Mt. Cameroon Project; Ministry	23 villagers; inventory team; NGO; Ministry; consultants	Community members (61); Management committee; Ministry staff; Researcher
GIT TOOLS	Topo sheets – Government and CDC;	Topographic sheets – from government and plantation company; 3 - Dimensional Impression of area	GPS; Physical 3-Dimensional Model; GIS mapping (ArcView)	GPS and compass for inventory; GPS; GIS mapping	GPS; GIS Maps of Bimbia Forest; GIS Mapping;
OUTPUTS	Socio-economic study report (Monograph)	Sketch maps (each user group, farms extents, current use, soils, forest pressure perception) Land use map	Forest Boundary map; (GIS)	Map of management zones / compartments	Sketch and GIS maps of (farm –forest as 1980 & 1990, rights perceptions); Narratives on same issues
TOOLS OF PARTICIPATION	PRA tools.	Participatory mapping; forest reconnaissance surveys;	Participatory mapping for forest description.	Participatory inventory; workshops; meetings	Participatory mapping; focus group discussions (PRA)
DEGREE OF PARTICIPATION	*Consultation*	*Decision-making, Empowerment*	*Mediation. Empowerment*	*Decision-making for zoning.* Some *Empowerment*	*Interactive, Facilitation*

The second step in the analysis consisted of critically reviewing project documentation to better assess the project design and implementation. (One of the authors had previously worked on the project for about six years).

The third step involved the application of Participatory-Rapid Rural Appraisal techniques such as focus group discussions, semi-structured interviews, diagramming and meetings. The choice of the method was guided by the mainly discursive nature of the data required in the analysis and the fact that these tools are flexible and put fewer restrictions on expression than pre-structured tools (Nyerges et al., 2002) thereby allowing ´looking for and learning from exceptions, oddities and dissenters´ (Chambers, 1994). 15 interviews and three focus-group discussions were held with key informants in Bimbia. Project staff was deliberately left out of the meetings to avoid biased responses. Transcripts were later read back to the interviewees and discussion group members for validation. All discussions, formal or informal, were based on the same checklists derived from the indicators in Figure 6.1. This ensured rigour and validity in the process through triangulation both of sources and in the methods, i.e. using secondary data, focus group discussions, interviews and meetings. A rigorous content analysis was employed to analyse the transcripts from the interviews, focus group discussions and diagramming session notes. Because most of the data is based on people's perceptions, we have been careful to make conclusions only on data from multiple sources.

6.4.5 Findings on the selected good governance dimensions

6.4.5.1 Participation (legitimacy)

Participation in sketch mapping, and using the unscaled physical 3-dimensional model was widespread, whereas use of GIS tools were restricted to mainly the outsiders, and operational committee members (see Table 6.2). Open popular meetings were the main forums for analysis and decision-making, while participation in decision-making for the map content involved just the consultants and experts. However, serious efforts were made by Mount Cameroon Project and the community leadership to involve women in parts of the participatory-GIS process.

Intensities of participation varied between activities. Figure 6.2 shows the participation intensities and purposes attained in the participatory-GIS process in Bimbia following 'participation ladders' from Catley (1999) and McCall (2003) respectively. The Catley ladder shows deeper involvement and higher quality participation progressing from levels I1 to I7. The McCall ladder refers to the underlying purpose or intentions behind the promotion of participation, which can be seen as a continuum from F as 'satisfying external objectives', to E as internally driven 'empowerment'. The higher the levels attained, the greater its contribution to good governance. The findings were that inter-group dialogue was improved through dynamic geo-information use to support participatory forums, leading to better understanding between actors, and towards conflict resolution.

Table 6.12 Participation (Legitimacy)

Involvement 0f Actors	Activities	Bimbia Mgt. Com.	Chiefs	Farmers	Timber Exploiters	Women	MINFOF	CDC	MCP
Involvement of Actors in Mapping Processes	Sketch mapping	N	Y	Y	Y	Y	Y	*Y*	*Y*
	GPS	Y	N	Y	N	*N*	Y	Y	Y
	Use of 3-D Model	Y	Y	Y	Y	P	Y	N	Y
	GIS processing	N	N	N	N	N	N	N	Y
Involvement in Decision Making on:	Land use allocation & land use rights	N	Y	Y	Y	Y	Y	P	Y
	Forest boundaries	Y	Y	Y	Y	*Y*	*P*	*Y*	*Y*
	Indigenous spatial knowledge inclusion	N	Y	Y	Y	N	N	N	N
	Carbon scenario analysis	Y	Y	Y	N	Y	Y	N	N
	To apply for land from CDC	Y	Y	Y	Y	Y	Y	?	Y
	Map content:								
	(a) Sketch maps	N	Y	Y	Y	Y	N	Y	Y
	(b) GIS outputs	N	P	N	N	N	Y	N	Y
	Final Map representation	N	N	Y	N	N	Y	N	Y

Key: Y= Significantly involved, N= Not involved, P= Partially involved

6.4.5.2 Empowerment

The PGIS process in Bimbia attained the highest empowerment level. The actors learnt of the need to protect the rapidly disappearing forest in the process and unanimously decided to apply for the return of forestland that had been leased to a state industrial plantation company in the area- i.e. the Cameroon Development Corporation (BBNRMC, 1999). This dimension of empowerment was achieved through joint learning during land use planning and forest use decision-making in which all the catalysts of empowerment namely, use of information, process, skills and tools were useful (Corbett and Keller, 2005).

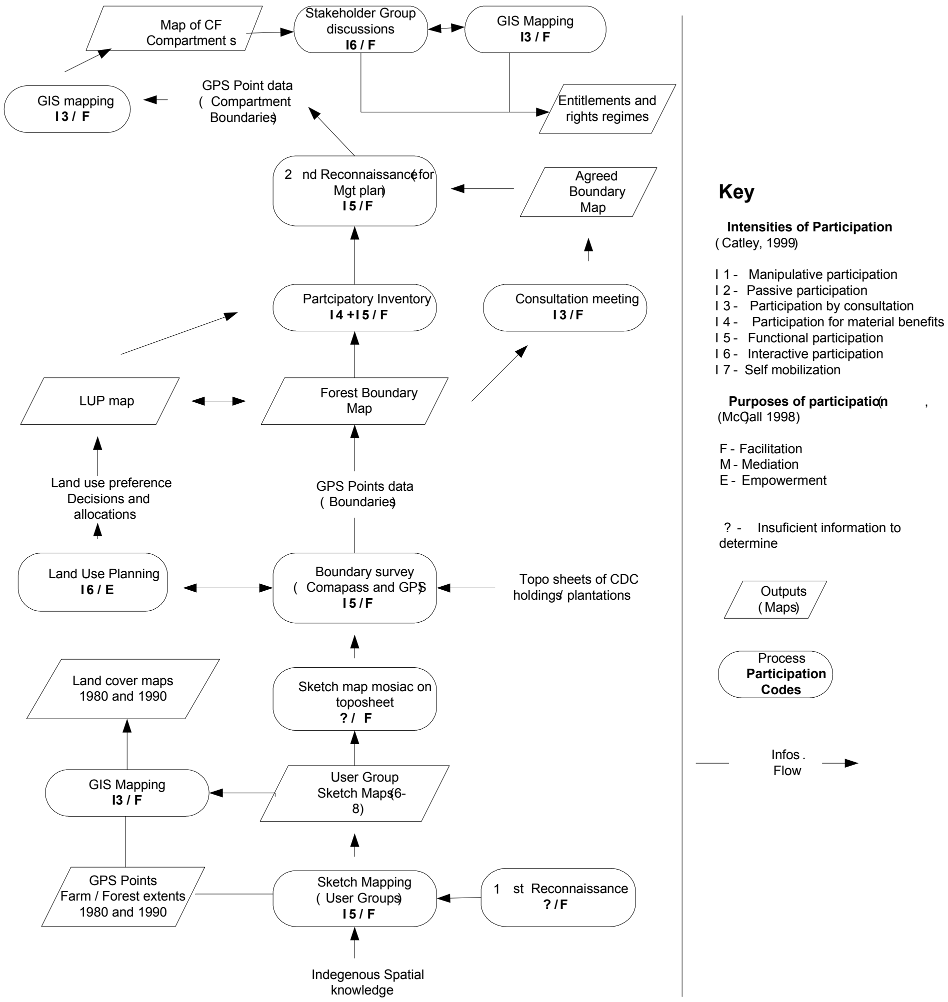

Figure 6.10 Participation intensities and purposes by activity in Bimbia PGIS

Knowledge and skills acquisition in geo-information technology *per se* were widespread through formal training and community participation in the process, but narrowly focused, especially only towards learning to use GPS, and sketch mapping. Table 6.3 summarises key aspects of actor empowerment in the Bimbia process, while figures 6.2 and 6.3 show the process and uses of geo-information employed.

6.4.5.3 Respect for indigenous knowledge & indigenous spatial knowledge

Some actors were empowered through the external recognition and use of their local knowledge in the map outputs. The participatory sketch maps showed more indigenous spatial knowledge than did preceding topographic maps, including village boundaries, forest farm areas, forest tracks, and local names of villages and streams. Historical sketch mapping in search of evidence of the state forest as at December 31st 1989 for eligibility within the CDM, made tremendous use of local knowledge. However females and their knowledge were not included in the mapping in the forest (Table 6.2).

Table 6.13 Legitimacy, ownership and empowerment

LEGITIMACY - OWNERSHIP									
'Ownership' of Geo-Information	**Types of Geo-Information**	**Bimbia MC**	**Chiefs**	**Farmers**	**Timber Exploiters**	**Women**	**MINFOF**	**MCP**	**CDC**
Access to Geo-Information and to GIS:	Analogue geo-information	Y	Y	*P*	*Y*	*P*	Y	**Y**	**Y**
	Digital geo-information	N	N	N	N	N	*N*	**Y**	**N**
	GIS facilities	N	N	N	N	N	*N*	**Y**	**N**
Use of Geo-Information:	Hard copies	Y	Y	N	P	P	N	**Y**	**?**
	Digital geo-information	N	N	N	N	N	N	**Y**	**N**
EMPOWERMENT OF ACTORS									
Actors Empowered by:	Manipulation or use of indigenous Spatial Knowledge	Y	Y	Y	?	Y	N	**P**	**N**
	Learning from process	Y	Y	Y	?	Y	Y	**Y**	**?**
	Involvement in geo-information training (Mainly GPS)	Y	N	Y	N	N	Y	**Y**	**N**

Key: Y= Significantly positive, N= Negative, P= Partial access

6.4.5.4 Ownership of geo-information outputs)

Access to standard geo-information, mainly maps, was relatively easy for the community and other actors through the community Forest Officer, but digital geo-information facilities and information access were difficult or impossible, except for the Mount Cameroon Project staff. See Tables 6.3.

6.4.5.5 Uses of Geo-Information

Figure 6.3 shows the various uses of geo-information in the community carbon forestry planning process in Bimbia following a framework by Craig and Elwood (1998). Geo-information produced in the Bimbia community forest-participatory GIS process was applied for all purposes: for strategic planning and assessing resources; in community organisation, especially for facilitating meetings; and in tactical operations, Geo-information was significant for highlighting specific resource locations; and for general administration.

There was however, little community use of digital geo-information. The Bimbia community used many paper maps for land use planning, in the community forest application process, and in conflict resolution. An example of use in conflict resolution involves the forest operations committee members recording and mapping GPS points for which local MINFOF has issued logging permits within the community forest as evidence for discussions with MINFOF. Another important use of geographic information in this instance was accompanying evidence in the application for the return of leased forestland for community forestry. The senior divisional officer recognized and endorsed the map forwarded to the Presidency of the Republic.

6.4.5.6 Equity – inclusiveness, and gender

In the participatory-GIS process and decision-making, some actors lost previously-held resource access rights or control powers, whilst others gained, thus changing the social power equations (see Table 6.4). Analysis of what would happen under carbon forestry scenarios also indicated potential loss of rights other than usufruct rights. However, it cannot be ruled out that some power shifts are not the result of the community forest and PGIS activities, but of extraneous globalisation factors. Moreover, the participatory GIS processes provided a platform for innovative meetings between stakeholders and helped build relationships and institutions. New structures emerged with responsibility for forest management, which gave disadvantaged groups, including women, a louder voice in decision-making. Records and attendance sheets analysis for Bimbia show that women were involved in the village meetings.

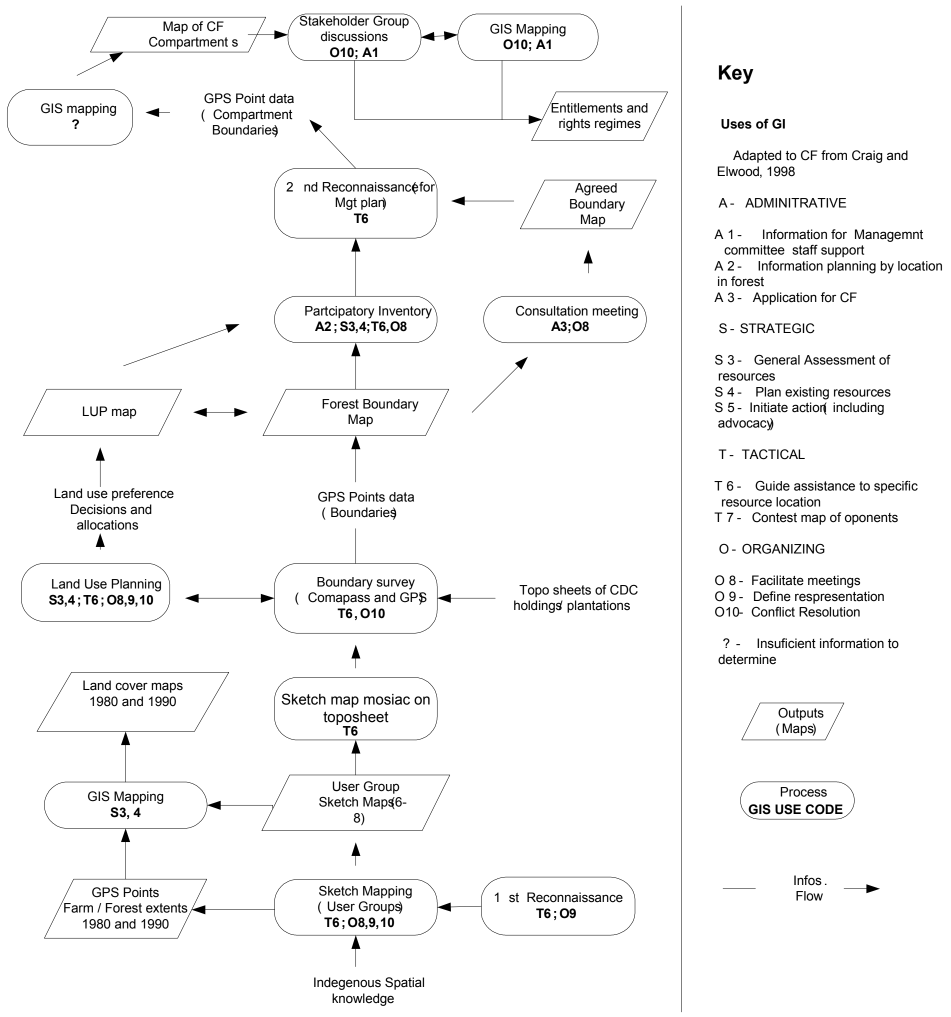

Figure 6.11 Geo-information uses in the Bimbia PGIS process

6.4.5.7 *Effectiveness and Competence – delivery of map products*

An assessment was made of actors' satisfaction with the maps delivered during the participatory-GIS process. Table 6.5 shows the degree to which the main actors were satisfied that the five map products met their specific needs. The products include sketch maps, the community forest Boundary map, the Final Management Plan, forest rights regimes (figure 6.4), and historical farm/forest frontier maps. Their interests were elicited from policy documents and through interviews.

Table 6.14 Equity Indicators

EQUITY - CHANGES IN RESOURCE CONTROL & ACCESS									
		Bimbia Committee	Chiefs	Farmers	Timber Exploiters	Women	MINFOF	MCP	CDC
Shifts in Power Relations (Carbon scenario analysis within community forest)	Changes in resource control powers	Gained control powers	Gained control powers	Lost control rights	Lost control rights	Gained control rights	Lost control powers	N/A	Lost control rights (expected)
	Changes in resource access rights	No change	No change	No change	Lost access rights	Lost access rights	No change	N/A	Lost control rights (expected)

6.5 Emerging issues for "good governance" enhancement through participatory GIS

Analysis of the findings reveals significant governance issues relating to planning participatory GIS processes and to the interactions along various participatory GIS interfaces applied to community carbon forestry.

6.5.1 Geographic Information Technology / GIS issues

When participatory mapping and participatory GIS interventions are aimed at mediation and empowerment purposes, the outcome from combining insider and outsider knowledge of the problems and potential solutions are expected to lead to greater competence, less wasted efforts, and increased efficiency. The results in this case demonstrated reasonably good achievements along these lines, but also revealed a number of problematic issues.

Firstly, we consider the relevance of the geographic information generated to serve community forestry carbon planning. Overall, the maps and GIS products satisfied between half and two-thirds of the actors' goals regarding geo-information (table 6.5). Boundary and forest management plan maps, initially meant to serve national community forestry requirements were found to be relevant for CDM requirements. For example, the boundary map is a direct CDM requirement while the management plan map served as the basis for carbon scenario analysis. It also constitutes the basis for baseline development alongside previous carbon modelling information in the project site (EcoSecurities, 2002). The process was also able to generate information on

Table 6.15 Meeting the geo-information needs

MAIN ACTORS	GEO-INFORMATION NEEDS	SATISFACTION OF NEEDS by geo-information outputs
CDM- Carbon information needs	Project Boundary	Boundary Map ✓ ✓ Forest Management Plan (FMP) ✓
	Land ownership and entitlements	Historical sketch maps ✓ Entitlements / Rights map ✓ ✓
	State of forest prior to Dec 31 1989 or 50 yrs ago	Sketch map ✓ Historical farm / forest frontier maps ✓ ✓
	Baseline inventory and comparison plots	None
	Environmental Impacts	None
MINFOF's geo-information requirements	External & Internal Boundaries of community forest	Final Management Plan (FMP) map ✓ ✓ Boundary map ✓
	1:50000 or 1: 200000	Boundary map ✓ ✓
	Major natural features	Boundary map ✓ ✓ FMP map ✓
	Socio-Econ. features: e.g. Protected Forests, settlements	Boundary map ✓ ✓ FMP map ✓
	Compartment (zone) descriptions	FMP map ✓ ✓
	Location of plant/animal species	None
Tinto Community's mapping needs	Community forest and Farm Zone boundaries ∅	Boundary map ✓ ; FMP Map ✓ ✓ Sketch map ✓
	Area under indigenous control	Boundary map ✓ ✓ Sketch map ✓ ✓
	Potential landmark areas: ∅ e.g. tourist sites and eco-trails	None
	Area reserved for farm extension ∅	Boundary map ✓
	Foot-paths ∅	Boundary map ✓
	Monitoring information on: Farm expansion, exploited areas	Boundary map ✓ Sketch map ✓
NGO (Mount Cameroon Project) needs map of:	Conservation Area	Boundary map ✓ ; Sketch map ✓ ✓ FMP map ✓ ✓

Key: ✓ ✓ = Largely meets the need, ✓ = Partially meets the need, ∅ = Geo-info particularly requested by the community project eligibility (i.e. historical sketch maps and points of 1980 and 1990 respectively) and land entitlements and rights (i.e. figure 6.4) through combining PRA and GPS use.

Independent analysis comparing the PRA and GPS maps of the state of forest cover to satellite imagery of the same period showed agreements of between 50 and 70% (see chapter 4 of this thesis for details). This shows that a PGIS based planning process can provide relevant evidence for CDM project validation and certification.

Secondly, the process revealed weaknesses in the representation capabilities of geographic information technologies. Though products from the study showed better or improved representation of community knowledge than any existing maps (i.e. local place and stream names, foot paths, village boundaries etc), PGIS could not completely resolve the representation of fuzzy land rights issues such as inheritance and power over resource use rights. Figure 4 does not show how much power each stakeholder wields or how power is shared. We also found that there is confidential and sensitive information such as hereditary rights that cannot easily be captured in spatial format. Therefore mapping alone is not sufficient for representing all the dimensions of land rights. One way of solving this would be to use linked text files to map objects such as land parcels explaining these resource rights and storing them in protected layers accessible only to designated persons or with permission, as suggested in Harmsworth (1998). FERN (2000), reported failures in a carbon forestry project in Uganda due to inadequate consideration of land rights and entitlements. However, an important question to ask in the planning process would be, what degree of precision is needed (McCall, 2006).

Thirdly, the access, use and storage of the geographic information influenced the efficiency of participatory mapping and participatory-GIS interventions in their contributions to good governance. Qualifying for carbon forestry credits within the CDM needs huge data collection, archiving for all variables (i.e. additionality, impact etc) and sharing with the operational entity in the validation and verification process (Lee, 2004). This implies systematic storage, retrieval and updating information management practices. Ownership and control of information must be sufficiently supportive of such a process. But unfortunately, during the PGIS process in Bimbia, most of the digital information was only directly accessible to Mount Cameroon Project. Though this can be explained by the lack of basic GIS technology in the community, the issue was not addressed at any point in the development of the participatory-GIS. Upon reflection, the Bimbia community should have kept the digital data on disk for future use.

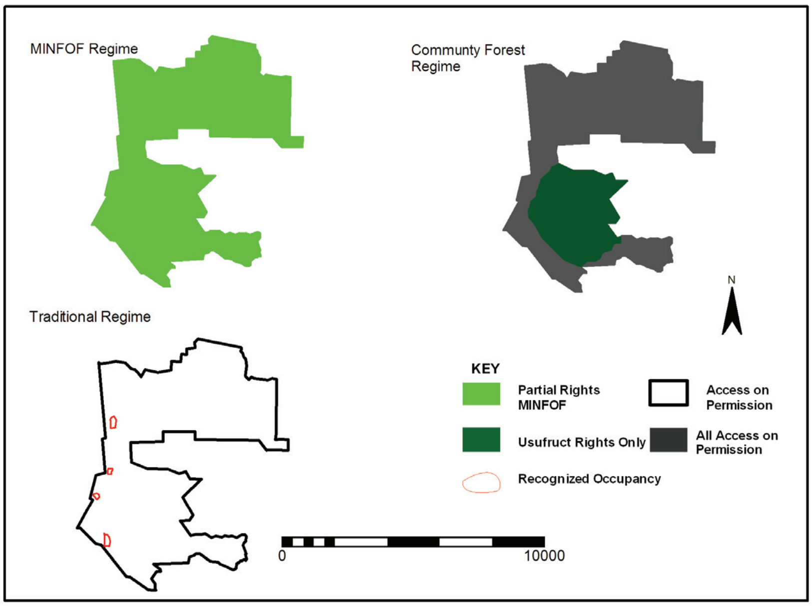

Figure 6.12 Entitlements and forest rights regimes as seen by main stakeholders in Bimbia

Digital geodata would also be cost saving for base map development. Currently, updating and use for carbon forestry purposes are inhibited by the inaccessibility of these data. This issue leaves the real ownership of the products questionable, as no known restrictions apply to the use of this information by the GIS unit at the Mount Cameroon Botanical and Conservation Centre, where the data is currently held.

Information access and use are highly relevant for issues of power, advocacy, institutionalisation and decision-making in community based-natural resource management (Alcorn, 2000; Elwood, 2006). From the results (as seen in Figures 6.2 and 6.3), a positive relationship can be established between the activities in which the highest intensities of participation and purpose are achieved, and those activities in which most use of geo-information is made. This supports findings, e.g. Kwaku-Kyem (2002), that improved communication and more robust relationship building are achieved with greater use of geo-information. Taking advantage of improvements in analytical and presentation / visualisation facilities in future participatory GIS would help promote deeper levels of decision-making in communities. In the Bimbia case, it was primarily just the location and descriptive uses of GIS that were taken up.

6.5.2 Equity and gender

PGIS highlighted a number of implications for equity in community carbon forestry. Most farmers have failed to pay a registration fee of about 2000 FCFA ($4) to the Bimbia Bonadikombo Forest Management Council. This is because they think traditional authorities consider them 'illegal occupants' of their land and so could impose prohibitive occupancy charges once they have registered. In the case where these many farmers who are considered illegal do not receive any share of the carbon benefits there would be serious consequences for their livelihoods. This could instigate forest users to rebel against the project, leading to project failure. It is necessary to develop a benefit sharing mechanism in which all would participate in order to have everyone feel secure and motivated. Studies have reported equity issues in carbon projects of this sort in Mexico and Bolivia (see Corbera, 2005 and Asquith et al, 2000)

Two main gender related problems were encountered: the insufficient number of women included in the process; and difficulty in bringing together older persons in peri-urban Bimbia Bonadikombo. Despite their predominant role in forest product harvesting, women were reluctant to participate in the study partly because they were very busy at that time of year. Assembling older persons in Bimbia was difficult due to their dispersion and their varied occupations. This made some group discussions irrelevant since elderly participants are critical for discussing history of land use (for eligibility) and tenure rights. To overcome this, more individual interviews of women and older people were done in a bid to complete and triangulate the necessary information. Women and other under-privileged or under-represented groups deserve specific attention in negotiations and decision-making not only for equity and justice reasons especially in Cameroon- see Ngwa (1995), and Ngwa and Fonjong (2002). For similar projects, it would be important to take this factor into consideration at the start of the PGIS process as other studies have also highlighted (see Elwood, 2006).

Overall, the expected positive gains in equity did not appear. The majority of stakeholders neither gained nor lost much in terms of powers of control or access to forest resources. Bimbia natural resource management council and the Chiefs gained some control over the forest dominion, but this was an inevitable result of the changed legal status, rather than from the participatory GIS process itself.

6.5.3 Potential Conflicts in Carbon Forestry

The resulting forest use rights information was found to be extremely relevant to CDM criteria, and for being able to predict the impacts on the community of implementing a CDM project. Figure 6.4 shows diverse tenure rights perspectives that had never been seen before. This approach shows overlaps and conflicts between these stakeholders in a new way. In Cameroon, following the 1974 land ordinances all forest areas without statutory titles are 'communal' and therefore subject to local traditional resource rights regimes. These forest areas fall under the recognised sovereignty of community chiefs who have certain political and legal, as well as attested ritual powers over it. Local rules of occupancy and rights exist but are sometimes contested by "non-indigenes" who argue that "communal" status gives them usufruct rights. The implications of duality of national vs. local and intra-local (internal) forest tenure systems are serious, and the conflicts between them need to be understood. 'Communal tenure' can imply free-for-all in the minds of users who claim rights because it is national land. This has implications for leakage in carbon projects. The restraining management measures that result from carbon projects like the CDM being adopted could lead to users relocating to other areas they deem 'communal'. This would mean that carbon sequestered, or emissions avoided, by the project would be 'leaked' or lost elsewhere and would be untraceable.

6.6 Conclusions

This study set out to test the potential of participatory GIS to facilitate the process of planning community carbon forestry projects within the CDM of the Kyoto Protocol by enhancing good governance. The implicit assumptions addressed by the paper, are that articulating participatory GIS at the local level is more effective than relying on conventional mapping and GIS, participatory-GIS is believed to have the capacity to simultaneously meet the CDM requirements, answer the questions asked of the geo-information, and address and satisfy the local stakeholders' underlying interests, thus the often-made assumption that participatory-GIS is a tool for better governance.

Good governance is initially interpreted as the empowering of community members' participation in decision-making and actions. Other governance dimensions and indicators relating to legitimisation, promoting respect for local people and their ownership of indigenous knowledge, strengthening equity, and improving effectiveness, were also employed. The case study was an ex-post assessment of the effectiveness of a participatory GIS approach in strengthening good governance in a community carbon forestry determination process in Bimbia Bonadikombo, Cameroon.

The study found that the participatory GIS and participatory mapping processes contributed – positively, though not comprehensively - to good governance while simultaneously meeting the information requirements for carbon forestry under the CDM. It contributed to good governance, by improving dialogue, legitimising and using local knowledge, some redistribution of resource access and control rights, and enabling local community groups by means of new skills training in geo-information technology. Participatory GIS further empowered by supporting community members' participation in decision-making and mapping actions, and by enabling forest use planning decisions beyond community forestry itself. There were however only slight progressive impacts on equity within the community, either in terms of differential resource access rights, or of full ownership of digital GIS outputs.

It produced relevant evidence for the CDM criteria such as land eligibility, project boundary, baseline development (i.e. additionality) and land ownership and entitlements. Furthermore, it brought forward vital information relating to conflicts, equity and gender, and information management that could influence CDM project validation and certification, leakage and risks.

In general, the intensive and enlightening process of developing a GIS in a participatory manner is itself capacity building and empowering. Essentially, the more community geo-information users who participate in the mapping processes, and the more local applications of the geo-information, the more robust the decision-making processes and, by extension, more vigorous 'good governance'. Participatory-GIS and participatory mapping create opportunities to visualise the interests and potentials of disparate groups in and around the community. Thus, the governed see the spatial implications of policies and actions, and the ´governing´ can recognise and appreciate the legitimacy of local interests.

When Participatory mapping and participatory-GIS interventions are aimed towards mediation to combine outsider and insider knowledge of the problems and potential solutions, the result should be less wasted efforts and more efficiency. A key element is that a genuine participatory approach enables respect for, and the integrity of, indigenous knowledge, by eliciting, analysing, and presenting conceptualisations of space and spatial values. In this case the community felt empowered by the participatory-GIS usage and deep consultations to apply for the return of leased land for forest management, demonstrating the capacity of 'working with maps' for engaging debate on sensitive issues, and enhancing accountability.

The study demonstrates that when it is the good governance criteria, chiefly the who, what, why, where and when issues of participation that drives the planning process- rather than having precise evidence for CDM purposes- then participatory-GIS is an acceptable, productive, reliable, and effective vehicle for supporting and strengthening participatory carbon forestry and community-based natural resource management in general.

Chapter 7

Multi-level governance conditions in Clean Development Mechanism forestry implementation: a synthesis

7.1 Introduction

This thesis set out to explain the extent to which local realities limit the scope of participation of developing countries in the CDM mechanism as far as forestry is concerned. Using Cameroon as an example, it attempts to illustrate how national, sub-national and local or project level variables constrain or enhance the implementation of CDM forestry in Africa, which is lagging behind with less than 2% of the share of all CDM projects to date and with no approved CDM forestry projects at all.

Local level CDM implementation in poor countries represents an extreme case of multi-level resource governance. Harmonising, maximizing or satisfying the global, national, sub-national and local level objectives, interests and approaches raises huge governance challenges for the CDM as with similar Multi-lateral Environmental Agreements (MEAs) in the process. Approaching policy implementation challenges from a multi-level perspective is not a theoretical or conceptual novelty. The "tragedy of the commons" and Hierarchy Theory provide some guidance and explanation to multi-level analysis relevant in this context.

Hardin (1968) argued in his seminal paper that users of common pool resources are caught in an inevitable process that leads to the destruction of the resources on which they depend because of impositions from the broader social and policy setting- hence a "tragedy of the commons" (Ostrom, 1999). By this he implied that the proper management of the commons depends on centralized (higher level) control and management and /or coordinated collective action and the establishment of institutional norms and rules of behaviour (Berkes, 2000; Cash and Moser, 2000). Ostrom et al., (1999) extend this thinking into the concept of the "Global Commons", wherein local common pool resource management is not only subject to sub-national and national conditions, but also to globally negotiated conditions. Carbon forestry, climate change and the CDM fit into the "global commons" category.

Hierarchy theory argues for a disaggregated but ordered examination of complex systems following structured processes at different scales. The logic is that a phenomenon at a chosen scale of interest is the synergistic result of the dynamics of system components at both the next lower and higher scales. Therefore capturing the driving and constraining forces at both the lower and higher scales is imperative for understanding the system at any given scale (Cash and Moser, 2000). Though hierarchy theory has been applied to natural and physical systems more often than to social systems, the same principles may apply to "soft" social and institutional systems (Checkland and Scholes, 1993).

Following these concepts, this study approached the challenges of CDM implementation through a multi-scale analysis. In part 1, the study started by looking at the compatibility between global and national policy (chapter 2); this is followed by an analysis of the global-level policy information demands versus the national, sub-national and local level supply capacities (chapter 3); and lastly by the global CDM policy requirements and the overall planning and management capacity of local communities (chapter 4). In part two of the study (Chapters 5 and 6), a number of Participatory Geographic Information tools were examined as one route to meeting the challenges of project creation that emerge in part one. The multi-scale analysis outlined above was approached through five key research questions. These were:

1. How compatible is Cameroon's national forest policy with the CDM forestry modalities? - Chapter 2
2. In what ways can the current forest data/information management infrastructure in Cameroon support carbon forestry uptake and implementation? - Chapter 3
3. To what extent can current community planning and management capacity meet the carbon forestry project requirements of the CDM? - Chapter 4
4. How effectively can local spatial knowledge provide land eligibility evidence for CDM forestry validation? – Chapter 5 And
5. In what ways can participatory-GIS contribute to community carbon forestry good governance in Cameroon? – Chapter 6

This chapter presents an integrative perspective of the study, that is, the multi-level enabling conditions and lessons that emerge from answering the specific questions above. Insights from the study have shown that successful landscape level implementation of CDM forestry is dependent on synergy of certain conditions or variables across the global, national, sub-national, local and even sub-local levels. These enabling conditions deserve cautious and conscientious attention in the policy making process at all levels since they might constrain or enhance CDM forestry project creation at one or more of the multiple levels.

7.2 Cross-scale conditions for CDM forestry Implementation

Table 7.1 presents five enabling conditions derived from this study, which are necessary for the implementation of CDM forestry. Main conditions are:

- Regulatory compatibility,
- Institutional synergy,
- Complementary capacities,
- Information availability and
- The presence of a governance mechanism or framework.

These conditions have emerged as those that must be actively catered for in order to ensure effective implementation of the CDM. In other words, for the CDM to be implemented at project level, it is necessary to do the following;

(i) Actively seek to promote or create positive potential driving factors at the project, sub-national and national level; and

(ii) Actively ensure that constraining factors are checked at project through national and global levels.

In the ensuing paragraphs, I elucidate on these enabling conditions following the findings of the previous chapters. National and sub-national levels are merged in the discussion because Cameroon is highly centralized. But in a decentralized country like India, these levels would be separated because key factors would be different in various states.

7.2.1 Regulatory compatibility

7.2.1.1 National Level Regulations

In compliance with CDM modalities under the Kyoto protocol, national forest policy has to undertake a number of steps if CDM projects are to be created. These include, deciding on a relevant definition of a forest, developing criteria for sustainable development by which projects would be assessed, defining an environmental impact assessment procedure for project approval, developing a project approval procedure at the national level, and clarifying forest and land rights and entitlements -see table 7.1. The study found that a CDM project approval procedure and sustainable development criteria had been developed in Cameroon. The remaining conditions have not been met and can be considered inhibiting or constraining factors for CDM forestry projects in Cameroon.

Cameroon is yet to specify a definition of forest as required by the CDM land eligibility rules (see chapters 2.5.2 and 5.2.1.1). The absence of a definition at national level blocks the creation of CDM forestry projects at the local level, because they cannot make an argument for eligibility, which is an important requirement. However, the study results suggest that the forest cover range of 10-30%, within which countries are required to choose, would be a limiting factor for project uptake given the diverse ecological landscape of the country. Choosing an upper limit of 30% for a definition in Cameroon would automatically eliminate over 60% of the lands and almost all community forests from CDM eligibility (see chapter 2.5.2).

Table 7.1 Enabling conditions for CDM forestry implementation

Main Condition	Level / Scale	Specific conditions
Regulatory compatibility	National / Sub-national	-Relevant definition of forest -Unambiguous forest and land rights -Impact criteria -Sustainable development criteria -Operational project review and approval procedure
	Community	-Forest management rules (access, harvest, sanctions) -Benefit sharing mechanism
Institutional synergy	National / Sub-national	-Functional Designated National Authority
	Community	-Functional Common property resource management institutions
	"Boundary"	-NGOs, Networks of local institutions, academic/research institutions and consultancies
Complementary capacities	National/ Sub-national	-Knowledge, skills, resources and technology for (project review and approval, market development)
	Community	-Knowledge, skills, resources and technology for project development
Data / Information availability	National / sub-national	-Adequate sectoral multi-scale data resolution repositories on agriculture, forestry and land use (metadata, data standards)
	Community	-Adequate project data infrastructure
Governance mechanisms / framework	National / Sub-national	-Policy arrangements for cross-scale linkages (e.g. co-management, government-community contracts)
	Community	-Research and management approaches that enable cross-scale linkages (e.g. PRAs, P-GIS, PAR, Adaptive management)

Clear and unambiguous land / forest ownership and entitlement rights are an important pre-condition for CDM implementation in practice (Smith and Scherr, 2003). Albeit not directly stated as a sine-qua-non within the CDM, analysis revealed that a duality in forest access and entitlement rights in Cameroon could increase risk of project failure and / or cost of negotiations and rules enforcement during CDM projects (see chapters 2.5.3, 4.5.5.2 and 6.5.1). Rights to earnings from environmental services are not mentioned in current forest regulations. Coupled with excessive discretionary powers for the Minister of Forests and Fauna to withdraw community rights and to add forest services to the list of special products (Ekoko, 2000; Oyono, 2004a; Vabi et al., 2000), uncertainty looms around carbon forestry project creation, thereby constraining and restricting momentum for project creation.

In terms of impact assessment procedures, we found that no official procedures exist, but it is not so strong a constraint for carbon forestry within community forests because the manual of Procedures and Norms for the Management of Community Forests (MINEF, 1998) accounts for a number of relevant aspects of social and environmental impacts in Cameroon (see chapters 2.5.5). Furthermore, experiences with impact assessments in the creation of dams and oil pipelines in Cameroon using World Bank assessment frameworks had been accepted by government as legitimate (Bitondo, 2000; Dames and Moore, 1997), hence setting a precedent. Nevertheless, clear and practical legislation would be desirable to enable carbon forestry implementation, as it would provide a standard framework for project assessment.

Sustainable development indicators for CDM project assessment in Cameroon have been defined –see annex 1 of Decision 00008 /MINEP/CAB, but are yet to be tested on any carbon forestry projects (see chapters 2.5.4). This involves 11 criteria that together have 26 indicators. The criteria are grouped as follows: 5 social criteria (equity and poverty reduction, relevance to national and local development, relevance to national and local sustainable development policy, well-being of local community, and social integrity of the local community); 3 economic and technological criteria (contribution to local economic viability, contribution to national economic viability, and technology transfer); and 3 environmental criteria (fight against climate change, preservation of environment and natural resources, and security and health). The actual scoring of the 26 indicators is done by a set of questions to which a binary response of yes or a no is required. The analysis revealed that the indicators were not tight enough and redundant in some cases.

A project review and approval process is operational in Cameroon following a Ministerial Decision of January 16 2006 (Annex 2 of Decision 00008/MINEP/CAB). It consists of two main steps, a primary review of the PIN and a secondary review of the PDD. The Secretariat of the DNA serves as a one-stop shop for project review and approval. The members of the Comité National MDP Cameroun (the DNA) do the project reviews. The President of the DNA can co-opt specialists or specialized institutions for purposes of project review should the representatives of the various Ministries, NGO, and industry not be found competent to fulfil these tasks. Some ten energy projects are currently navigating the review process but are still at very early stages and no forestry projects have yet been initiated.

It was found that current procedures do not give sufficient attention to land and forest rights issues, unlike the Indonesian procedures for example (see chapter 2.5.6). In the Indonesian case some power for evaluating and approving land ownership and forest entitlements has been given to local authorities (Masripatin, 2005), which could be just as prudent and efficient in the case of Cameroon where land right regimes vary enormously (Fisiy, 1997; Chi, 1999). Moreover, if this is done within community forests, fewer problems are expected as the community forestry procedures have built in mechanisms to minimize these problems.

7.2.1.2 Community Level Regulations

Community regulatory conditions identified by this study include adequate forest management rules for access, harvest and sanctions and the presence of a benefit sharing mechanism. Though neither are written as requirements in the CDM modalities, they have been identified as crucial factors for project implementation and for addressing several CDM criteria including, additionality, permanence, sustainable development - see chapter 4.5 (Smith and Scherr, 2003; Asquith et al., 2002; Corbera, 2005). This study found that both regulations were well established in both the Tinto and Bimbia Bonadikombo community forests but problems exist with their implementation (see chapters 4.5.5.2 and 4.5.5.3). Inadequate capacity and power imbalances within communities explain these failures in the implementation of community forestry rules and mechanisms –see table 4.5. Similar findings have been reported elsewhere in Cameroon (Mvondo, 2006a; Mvondo, 2006b).

7.2.2 Institutional synergy

Functional institutional synergy is a necessary condition for CDM project creation across all levels of governance. Institutions need to fulfil specialized functions at international, national and project levels to enable the implementation of the CDM. Firstly, CDM modalities call for the creation of Designated National Authority charged mainly with project appraisal and approval at the national level. Secondly, project development and monitoring requires the presence of a functional organization around which project proponents build a project. Thirdly, this study also confirmed the conclusions of analyses elsewhere, that institutions for facilitating institutional linkages at different scales are needed for the creation of CDM projects (Michaelowa, 2003; Poffenberger et al., 2002; Subak, 2000; Nelson and de Jong, 2003).

7.2.2.1 National Institutions

Cameroon's Designated National Authority is called the Comité National MDP Cameroun. Created in January 2006, it is a 12 member inter-ministerial committee with representatives from six ministries, one NGO representative and 2 representatives from industry (see chapter 2.5.1) One earlier criticism of the "inter-ministerial committee" model of DNAs is that members have been frequently changed in other countries thereby losing valuable experience (Michaelowa, 2003). This problem has not been sufficiently addressed by the statutes of Cameroon's DNA (see chapter 2.5.1). However, its presence means the minimum institutional conditions for project development at national level has been met. About 10 CDM energy projects are currently under review. However, it is early days yet to judge its performance.

7.2.2.2 Project Level Institutions

Project level institutions are required to coordinate, negotiate and manage project development and monitoring. These project transactions can be fulfilled by legal entities within community forestry. In Cameroon, communities can choose one of four institutional types, an association, an economic interest group, a common initiative group or a cooperative- all of which have specific legal definitions in Cameroon. Most community forests such as Tinto and Bimbia Bonadikombo are run by local organizations of this type, hence the minimum institutional conditions are right for CDM implementation in these settings (see section 4.5.5).

7.2.2.3 Cross-Scale Institutions

Institutions for cross-scale linkages are not a CDM prescription, but have been found to be useful in project uptake and implementation in other countries such as Mexico or India (see chapters 3.5.1, 4.3 and 4.6). These institutions would fulfil roles such as technology transfer between annex 1 and non-annex 1 countries, communicating the complex science of mitigation to national policy makers and project proponents (e.g. the IPCC), helping in training and capacity building for project development or helping to link competent national resource persons with interested project developers (Moltke, 2002). NGOs, academic and research institutions or consultancy firms can fulfil this role. Cash and Moser (2000) have branded these institutions as "boundary institutions" because they are mediating between the global, national, sub-national and local levels.

Evidence from this study shows that community forestry development was facilitated by boundary institutions- i.e. Living Earth and Mount Cameroon Project for Tinto and Bimbia respectively. Procedural difficulties similar to those of the CDM highlighted so far arose when the 1994 community forest law came into force in Cameroon, but NGOs and bilateral projects stepped in and facilitated implementation (MINEF, 2003; Ekoko, 2000; Oyono, 2004b; Brown and Schreckenberg, 2001). A number of relevant carbon forestry initiatives by NGOs have been reported in Cameroon – (see chapters 2.5.1 and 4.5.5), but they are not sufficient. These initiatives indicate interest in carbon forestry from boundary institutions in Cameroon. There is need to actively canvas for greater NGO involvement in facilitating project development and capacity building to trigger the kind of action required to bring Cameroon and Africa up to speed with CDM project creation.

7.2.3 Information availability

The CDM is information / data driven mechanism in which projects must provide verifiable evidence demonstrating adherence to CDM criteria of eligibility, additionality, leakage, externalities and acceptability (see chapters 3.4.1, 4.5.1 and 4.5.4). We found that though a national data infrastructure is not an absolute CDM requirement, it can be supportive to project creation as some data requirements are beyond the skills and capabilities of local level institutions (see chapter 3.5.1). Hence, the absence of an appropriate data infrastructure across the macro, meso and micro levels would inhibit project uptake and vice versa.

7.2.3.1 National Level Information

A national or macro and meso level data and information infrastructure on agriculture, forestry and land use is important for CDM forestry uptake (see chapter 3.3.4). Examples of data needed would be leakage data that often relates to demand and supply of forest products and activity displacement beyond the boundaries of projects; default data on soil carbon; carbon accumulation factors under different land uses and in various ecological zones of the country that is needed for baseline estimation and project feasibility analysis. Central government agencies or boundary organisations at national level could also facilitate the acquisition and use of remote sensing data for carbon projects. We found the data and information available for these purposes was inadequate at national level in Cameroon (Table 3.2 and chapters 3.4.1.2). Data collection is not planned and as such not at the right resolution for use in carbon planning. Similar data and information conditions were found to render project development difficult in the Mancherial Forest Division, Andhra Pradesh, India (Murthy et al., 2006).

7.2.3.2 Project Level Information

Local or project level data infrastructure are the nerve centres of carbon forestry project development. The data demands are quite cumbersome and complex for data poor environments in developing countries, hence one of the greatest constraints to project development. Figure 3.2 summarizes the data demands for carbon forestry. Our assessment of the information supply capacity of the Tinto and Bimbia communities confirmed that these demands are beyond the reach of these communities (see Table 3.1 and chapters 3.4.1.1). Capacity building, training in emerging PGIS methods and the involvement of skilled boundary institutions are suggested as key strategies necessary to enable adequate information supply for CDM projects (see chapters 3.4.2.5). Further research is required in the area of physical data modelling at the micro-level (based on conceptual model in figure 3.2) in order to fully understand the ramifications of information dynamics of various CDM requirements across-scales.

The PGIS methods suggested to improve information availability have been trialed with great success in developing countries - chapters 3.4.2.3, 5, 6.4 and 6.5 (Skutsch, 2005; Verplanke, 2004; McCall and Minang, 2005). They are high-tech but simple, cost effective and usable by local people with reasonable accuracy. They can potentially enhance local knowledge acceptability within the Kyoto protocol (Minang and McCall, 2006). Berkes (2000) and Ostrom et al., (1999) also recognize the need for such approaches capable of bridging the knowledge and information differential between different institutional levels in the management of the global commons.

It is also important to note that while some of these methods are well developed in the literature, specific applications to carbon forestry still need to be trialed and improved. More research is therefore needed in this area.

7.2.4 Complementary Capacities

Another enabling condition for project development is the presence of complementary scale-specific capabilities within the host country CDM landscape. This is to say, national level institutions have to have capabilities to review and approve projects, create enabling market and investment environments and support project development, while local institutions need capabilities to conduct feasibilities studies, develop the PINs and PDDs, monitor projects and carry out transactions for validation and with investors (see chapters 2.5.6 and 4.5 respectively). In some cases, as in the case of Indonesia, District authorities (sub-national level) are called upon to have skills to verify and approve land and resource tenure conditions in potential projects as part of the national project approval process (Masripatin, 2005).

7.2.4.1 National Capacity

National level knowledge and skills required for CDM support is not in short supply in Cameroon. Article 3 (3) of the DNA statutes in Cameroon allows for the DNA to co-opt any competent persons or institutions as needed in the fulfilment of its duties. Despite the coordination difficulties and financial and material difficulties inter-ministerial committees have experienced in other countries (Michealowa, 2003), it might be too early to assess the capability of the Cameroons DNA given that it was only officially created in January 2006 (see chapters 2.5.6). However, it needs to move quickly to make good the provisions of funding from the National fund for environment and sustainable development and from the special forestry development fund. In the past, inter-ministerial committees in Cameroon have experienced funding problems.

There is need for improving national capacity to generate relevant data for carbon forestry especially given that reduced emissions from deforestation and reforestation REDD, a potential national or sub-national alternative to CDM forestry is currently being discussed within the Kyoto Protocol Framework -see chapters 3.3.2 (Santili et al., 2005; Skutsch et al., 2006). This argument is strengthened because any such data would also serve wider sustainable forest management objectives, especially biodiversity and watershed environmental services.

7.2.4.2 Local Capacity

This study found that current local knowledge, skills and resources fall short of the CDM capacity requirements (chapters 4.5 and 4.6). The Tinto and Bimbia communities only have skills for participatory logging inventories during which only trees with dbh of about 30cm are measured. Carbon inventories will need multiple plot layouts, and the measurement of several variables including trees with dbh of 5-10 cm, root estimation, destructive sampling etc. Remote sensing knowledge and skills will also be needed. Personnel is also short in these communities to enable such adequate data collection- for instance, the ratio of staff to forest area is 1:285 ha and 1:120 ha in Bimbia and Tinto respectively. These communities also have inadequate financial resources to hire such services – see table 4.3 and chapter 4.5.1.

The capacity deficiencies highlighted above is one of the greatest constraints to project development and needs urgent attention for CDM forestry implementation to move forward. An upsurge from zero to 10 CDM energy projects in preparation in little over a year in Cameroon illustrates how capacity building can be helpful. The upsurge in projects can be attributed to UNEP/World Bank capacity building project called “Using Carbon Finance to Promote Sustainable Energy Service in Africa” CF-SEA (CN-MDP Cameroun, 2006). This kind of capacity building is required in the forestry sector (see-chapters 3.5.1, 3.5.2 and 4.6).

7.2.5 Governance Mechanisms / Frameworks

7.2.5.1 National Level

Experience in the development of carbon projects shows that having an overarching policy framework at the national or sub-national level, and vehicles of good governance that enable local level linkages to the wider national and global system, can be helpful. Such an approach would enable the kind of investment climate that is necessary to attract carbon investors and ensure good governance for forests and land resources, both of which have been cited as part of the reasons for Africa lagging behind in the carbon market (Desanker, 2005; Jindal et al., 2006; Capoor and Ambrosi, 2006b).

The Private Forestry Programme in Costa Rica is an example of a national framework that brought together national, private and community actors in the development of agroforestry and community forestry carbon forestry based mitigation (Subak, 2000; FAO, 2004). It clearly defined roles and responsibilities of stakeholders and also provided the right incentives for participation. Though the Costa Rican system was not meant for the CDM, countries such as Cameroon could develop model programmes that can serve both the CDM and non-compliant markets.

This study explored the possibilities of community forestry in Cameroon serving as a CDM implementation framework. It found that the institutional dynamics required in terms of roles and responsibilities and procedures for review and approval of projects were reasonably well developed compared to CDM requirements (- see chapters 2.5.6.). However, it would need fine-tuning in the light of specificities such as leakage and additionality. Though plantation forestry and agroforestry plantations also allowed for private investments, they did not have the elaborate procedural and regulatory specifications that community forestry has (MINEF, 1998). Several studies have identified the good governance potential in the current community forestry framework in Cameroon (e.g. Brown, 2003; Brown and Schreckenberg, 2001). Klooster and Masera (2000) also found community forestry in Mexico as a useful framework for achieving the carbon forestry objectives of the Kyoto Protocol.

7.2.5.2 Project Level Mechanisms

Local level practice and learning of community forestry good governance is growing. This is partly due to the successful application of various participatory planning approaches to enhance local governance including Participatory

Geographic Information Systems – PGIS (McCall and Minang, 2005; Craig et al., 2002).

Results from an application of PGIS for carbon forestry in these communities confirmed that this approach can be a good governance vehicle and can also provide the information requirements (e.g. eligibility and land use rights) of the CDM- see chapters 6 and 5. Other variations of this approach especially Participatory Mobile GIS, have been applied for carbon inventories with great success in Tanzania, Nepal, Senegal and India. Its application is growing in this sector and could be an important part of future research and capacity building for carbon forestry in Cameroon and other Non-Annex 1 countries. Berkes (2000) also point to Participatory Action Research- PAR, adaptive management and ecosystem-based management as landscape level approaches that can achieve more general and cross-scale linkages in natural resource management.

Suffice it to mention that during this study, it was discovered that another enabling condition for carbon forestry implementation could be "a favourable market price for carbon". Some interviewees especially NGO staff, argued that they could seriously consider initiating carbon forestry projects if prices are competitive enough against current timber prices. This I did not explore further as this was outside the scope of this study. It is also necessary that further research looks more into the domain of the project level opportunity costs (including livelihoods) to better develop the picture of what enabling conditions are required for CDM implementation.

Also worth noting is the fact that the enabling conditions elucidated above are interactive in reality. The isolated or linear presentation of each condition is an attempt to simplify understanding and to highlight aspects that may otherwise be diluted if they are presented in an integrated fashion.

7.3 Global Level Implications

7.3.1 Cross-scale enabling conditions for CDM / Kyoto implementation versus other MEAs

The foregoing analysis of cross-scale enabling conditions for implementing the CDM mechanism of the Kyoto Protocol highlights governance challenges that other Multilateral Environmental Agreements (MEAs) face in the implementation process. Issues of regulatory compatibility, institutional synergy, complementary capacities, data and information availability and frameworks and mechanisms for governance can partly explain why so little progress has been made on mitigating or stemming global environmental problems despite over 500 existing multilateral environmental agreements. The Millennium Ecosystems Assessment (2006) brought forth evidence of failure to mitigate a wide range of environmental problems by the current complex of MEAs and Institutions that ensure global environmental governance. In addition, it identifies in its Result number 4 that the main challenge for institutions and governance is to enhance intersectoral cooperation and a coordinated response at multiple scales- international, national, sub-national and landscape.

Some experiences from the United Nations Convention to Combat Desertification (UNCCD), the Convention for Biological Diversity (CBD) and the Montreal Protocol support the relevance of tackling the enabling conditions that are identified for CDM forestry implementation within the Kyoto Protocol. Suffice it to mention that the Kyoto Protocol and the CDM in particular are somewhat different from both the desertification and the biodiversity convention. The CDM is project-based while the others are nationwide approaches. Certification is obligatory within the CDM and optional in the CBD (although encouraged by the convention), while this is completely absent within the desertification convention. As a result, the Kyoto Protocol and the CDM in particular are more prescriptive and demanding about reporting and monitoring requirements than the others. One international environmental policy instrument that compares to the CDM in its information and procedural requirements and project structure is forest certification (Subak, 2002). But I do not use it here to draw parallels because it is not the object of a global convention like the UNCCD and the CBD. Despite the differences between the UNFCCC, the UNCCD and the CBD, the examples below show that the requirements for successful implementation remain similar for all three conventions.

As part of an ongoing review of implementation, the UNCCD published a report on the experiences of 10 African countries (UNCCD, 2006). They report improvements in the implementation of measures to combat drought and desertification in Burundi, Cape Verde, Djibouti, Ghana, Kenya, Morocco, Niger, Swaziland, Tunisia and Zambia as a result of proactive policy actions. These actions include, developing institutional and legislative arrangements; resource mobilization and coordination, including conclusion of partnership agreements; participatory processes involving civil society, non-governmental organizations and community-based organizations; linkages and synergies with other environmental conventions and, as appropriate, national development strategies; monitoring and assessment through a cooperative information management effort; and direct state measures for the rehabilitation of degraded land. For illustration purposes a few examples are introduced below.

Kenya and Burundi achieved better results in the fight against drought and desertification through institutional and legislative framework improvements. In Kenya, the government created a National Environment Management

Authority in 1999, which in itself is not strictly an organization but a semi-autonomous coordinating body for all MEAs with members from all major ministries, NGOs and research and academic institutions. They also enabled the creation of Provincial and District environment committees that coordinate action on various environmental themes. At each level all key stakeholders are involved in the committee. An important element in the reforms in Kenya was the establishment of the Desertification Community Trust Fund, which was launched in 2004. It is a government-funded programme to enable Kenya to combat desertification. This trust fund has successfully assisted projects in the Narok, Malindi and Baringo districts. In Burundi, the land and forestry codes were revised to make them compatible with action to combat desertification. Land ownership rights were enhanced especially for vulnerable groups that had suffered uncertainty such as widows and orphans, making it easier for them to obtain certificates that served as deeds. Communities were also encouraged to manage woodlands on communal lands. These measures acted as incentives for individuals and communities to invest time and resources on land rehabilitation activities.

Tunisia adopted a holistic and participatory vision of monitoring and evaluation of desertification and land degradation. First a cross-sectoral National Committee for combating desertification was set-up in 1996, with a vision to integrate the fight against desertification into the national economic and social development plan. But the most interesting driver of Tunisia's success is the Desertification Information System (DIS), setup through the involvement of the Mederine Arid Regions Institute (IRA), the National Remote Sensing Centre (CNT) and the Sahara and Sahel Observatory (OSS). The system has two components, an annual collaborative impact assessment of activities aimed at combating desertification; and a five-yearly overall evaluation of the state of natural resources from the district level through national level. Main tools used include an indicators catalogue, mapping (GIS and Remote Sensing) and topical inventories. Information from this system is accessible through the national environment web portal for all levels of planning for land rehabilitation and for natural resources in general. This system is reported to be playing a key role in other sectors in the country.

Examples from the Biodiversity Convention are not as explicit as those of the UNCCD. However they also point to the necessity of putting key enabling conditions right in order to deliver results in the implementation of environmental agreements. An examination of the 3rd National Report for Cameroon to the CBD secretariat highlights a number of challenges and obstacles to the achievement of the countries National Biodiversity Strategy and Action Plan (NBSAP). Notable amongst the long list and having the worst scores are: lack of mainstreaming and integration of biodiversity into other sectors; lack of capacity for local communities; lack of synergy between national and international levels; lack of horizontal cooperation among stakeholders; lack of transfer of technology and expertise to other levels; and loss of traditional knowledge. These problems were also widely echoed in the interventions of the country representatives of developing countries such as Tanzania, Algeria and Kiribati in the report of the first meeting of the Adhoc Open-ended Working Group on the review of the implementation of the Biodiversity Convention.

These examples show that the enabling conditions elicited in this study are also relevant for the implementation of other multi-lateral environmental agreements and therefore could constitute a relevant approach for improving multi-level environmental governance especially in developing countries.

Unlike the CBD and the UNCCD, the Kyoto Protocol and the Montreal Protocol share quite some similarities. Firstly, they tackle environmental problems that have global effects in the short term (i.e. climate change and ozone depletion), as opposed to desertification or loss of biodiversity that will have only local effects in the short term. Both conventions fall among a short list of multilateral environmental agreements that have binding time-bound targets or caps for parties - with the exception of developing countries in the case of Kyoto.

Despite these similarities, the Montreal Protocol stands out as one of the success stories among the hundreds of MEAs (Mitchell, 2003; Najam et al., 2006), whilst Kyoto is still suffering post-natal problems at the age of ten. The success of the former is explained by many variables, mainly, the nature of ozone depleting substances, which are easy to monitor at the level of industry and through trade trajectories and the fact that parties to the Montreal Protocol agreed on the principle of “common but different responsibilities” in a way that took care of the equity issues and the fears of developing countries. Compared to the diversity and importance of energy sources from which greenhouse gases originate, tackling climate change inevitably involves significantly higher opportunity costs to economies than ozone depleting substances. These high costs have fuelled the reluctance of many countries to signing up or aggressively pursuing their targets as parties to the Kyoto Protocol.

Suffice it to note that the success in reducing ozone depleting substances in the Montreal Protocol has been largely due to the effort of developed countries. Non-Article 5 countries (transition countries, e.g. India, Malaysia, Brazil) and Article 5 countries (developing countries) have largely not met their targets (IISD, 2006). However, some of these countries are making progress thanks to the support of the Multilateral Fund for the implementation of the Montreal Protocol, set up to specifically help developing countries meet the technological, cost, resources and information demands. It is the largest fund within the MEA circle amounting to about $147 million a year (Najam et al., 2006). It is performance based, involves independent verification, but it also has provisions for penalties for non-achievement. A facilitative approach is often used in dealing with non-compliance, given that in most cases non-compliance is mostly due to incapacity rather than intentional disregard for rules. Otherwise a suspension from treaty privileges and a ban on trade in regulated substances are amongst options for sanctions (Tenner, 1999)

This support framework differs from that of the Kyoto Protocol. For example, only about $ 9 Million was available through the UNFCCC special fund for participation in implementation or supplementary activities between 2001 and 2002 (Najam et al., 2006). Major financing for non-annex 1 parties (developing countries) has come through projects involving the World Bank funds, GEF, UNIDO and several NGOs and not from a central fund devoted to the implementation of Kyoto. As a result developing countries receive far less support within Kyoto than in the Montreal Protocol.

Perhaps the conception of the instruments of the Kyoto Protocol as market-based mechanisms partly explains the slow start in this instance. The CDM is unique in the global environmental governance landscape especially because it involves trading between developed and developing countries. I think that this market characteristic raises the bar in terms of requirements for reporting, verification and certification to a level that has not been seen in other regular environmental agreements. This in itself is a huge challenge to manage and this study partly illustrates this. The second aspect, which this study does not address, is the fact that developing countries have the extra duty to create the right environment for foreign investments (Capoor and Ambrosi, 2006a). An environment of trust, little uncertainty, presence of guarantees for justice and the rule of law is necessary to attract investments, but many poor countries lack these variables. This is one of several factors that explain the remarkable difference between carbon trading prices within the EU Emissions Trading Scheme ($10-16 /tC on average) and the CDM ($3-5 /tC on average) even though both serve the same purpose and all come under the Kyoto Protocol. More so low CDM carbon prices do not provide sufficient incentive for land use management in many developing countries compared to timber or other farming alternatives (Tommich et al., 2002).

These peculiarities and difficulties of the CDM raise serious questions about the future of cap-and-trade mechanisms such as the CDM as instruments for global environmental governance, especially with the involvement of developing countries that are not “market economies”.

7.3.2 Cross-scale enabling conditions and multi-level environmental governance thinking

Esty and Invanova (2002) make the case for a global environmental mechanism that will fulfil not only form (jurisdictional or institutional dependence on nation states) but also key environmental governance functions (information and implementation) that are not adequately met in the current arrangement. Such a mechanism would include an information clearinghouse, a technology clearinghouse, a bargaining forum and networked governance. An advantage of such a mechanism is that it does not add any new layer of bureaucracy, but rather provides an opportunity for exchange in a less hierarchical and complex way. Though this model is developed for the international level alone, some similarities can be drawn with the multi-scale conditions identified in this study. Table 7.1 proposes institutional synergy through networks, the provision of accessible and appropriate data for action at multiple scales, complementary capacities, policy compatibility enhancement, and governance mechanisms and frameworks. These conditions emphasise in much the same way the governance form and function proposed by the global environmental mechanism model. Except that a cross-scale perspective from international to local level is demonstrated as the shift in focus required to produce MEA results in this study.

The discussion also highlights the point that maximizing the enabling governance conditions, and whether or not they are considered at all, would also depend on the country's perception and preferences on equity, ethics and environmental justice within the international context. Developing countries think mitigating climate change and pollution should be the responsibility of developed countries because they caused it, or that the cost of adaptation in developing countries should be borne by these countries as well. Other forest rich countries think environmental issues should not be used as an excuse to stifle growth because developed countries used their natural resources for economic growth as well (Najam, 2005). Right or wrong, the position and preferences of each country would influence the vigour with which the state tackles environmental governance and as such the conditions elicited in this study. The European Union's commitment, the objections of the United States, and the reluctance of emerging economies in the south to take on commitments within the Kyoto Protocol illustrate the divergence in views and motivation that could influence a nation's efforts towards environmental agreement.

Findings from this study also challenge previous MEA approaches to national level environmental governance. Most MEAs have hitherto called on governments to develop national strategic plans, create focal points and or local implementation agencies that will ensure implementation, monitoring and reporting on progress. Prominent examples of such plans include the National

Environmental Action Plans (NEAPs), National Action Plans (NAPs) for the Convention to Combat Desertification –UNCCD and the national Biodiversity Strategy and Action Plans (NBSAP) for the Convention on Biological Diversity-CBD. After the governments provide such plans, all that is left for the most part is the regular reporting requirements under the conventions. The working of institutions and processes that ensure implementation is peripheral and a matter for few projects and not often a strategic priority. Very often technology transfer and capacity building have been financed through projects under various partner agencies such as GEF, UNEP or UNDP, but few projects have specifically addressed relevant enabling conditions in a structured way. This has traditionally been seen by the MEA secretariats as the responsibility of the national governments, but in reality these levels (i.e. landscape, sub-national levels) represent levels at which practical action is taken and therefore deserve sustained support from the supranational institutional framework.

One fundamental challenge of environmental governance at national level is the coordination of actions for multiple focal points of the various environmental agreements. These problems are often interdependent and success would depend on cooperation. Ministries and inter-ministerial committees have become popular models for policy coordination, but coordination of action at sub-national and ground level is often weak. Some countries have created National Environmental Management / Protection Agencies in a bid to overcome the problem of coordination of practical action – e.g. Ghana, Uganda and Kenya. But these organizations have the potential to stifle the innovativeness that current multi-centred environmental action (i.e. multiple focal points and agencies) has at the national level. The competition and ambition in the current multi-agreement policy space allows for some creativity that would otherwise not be seen in these central environmental agencies. This criticism holds true for the proposal to create a world environmental organization that oversees all MEAs in a more assertive way than UNEP.

Of course it can be argued that the literature on environmental and resource management has addressed some of the enabling multi-level conditions of governance being discussed. A good example of a multi-lateral agreement is the EU environmental directive and the principle of "subsidiarity". The principle of subsidiarity is the idea that central authority should have a subsidiary function, performing only those tasks that cannot be performed effectively at a more immediate or local level. While a lot can be learnt from this experience, the contexts are different and the capacity differential in the EU is much smaller than in a global scenario involving a wide range from very rich to very poor countries. The body of literature on "subsidiarity" and on natural resource (forests, water etc) decentralization (Larson and Ribot, 2004) can be helpful, but the discussion is often limited to the "form" of environmental governance. These concepts, "decentralization", "subsidiarity" or "new federalism" mostly go back to the basic question of the "right level" of governance instead of recognizing that various levels are operating together (Bressers and Rosenbaum, 2003).

This implies that multi-level governance should not be an issue of "nested" levels of institutions but rather an interconnection process between actors (Conzelmann, 1998). The effectiveness in interconnection is by default multifaceted and determined by the motivation (perception and interpretation of policy instruments, values, preferences and incentives), power (the relative ability of actors to influence policy as determined by bargaining strength and resources) and information (availability, access and control) (Bressers 2004; Bressers and O'Toole, 2005; Bressers and Kuks, 2003).

The enabling conditions elucidated in this study do not only pertain to the form of governance but also address the "function" aspect of governance, in which all levels function as one system. A system in which, dynamic processes operate rather than simple links between various levels.

Problems with several natural resource decentralization models such as community forestry, collaborative resource management etc (Larson and Ribot, 2004; Ribot, 2003) illustrate that the main challenge is having the right conditions that support and enable "functional inter-relatedness" of actors in environmental management- both vertical (multi-level) and horizontal. Though the evidence from this study might be limited for making conclusions, it does however, support the case that for "global commons" or global environmental actions, the spectrum of "functional interconnections" should not only be national and sub-national but should include the supranational.

So far, the literature on global environmental governance has focused mainly on the interface between the international and the national scale, with attention given to coordination and information management issues amongst the numerous international institutions of governance for various MEAs (Cash and Moser, 2000; Esty and Ivanova, 2002; Gupta, 2002; UNU, 2002), often ignoring the sub-national and local levels where ultimate action is required to achieve the MEA objectives. This study has contributed through reflections on linkages across scales- i.e. from supranational to local, in relation to the Clean Development Mechanism of the Kyoto Protocol.

The challenges for moving forward with good environmental governance may include finding the right instruments that enable cross-scale network organizations, knowledge and information development and use, policy development and negotiation processes. Such instruments will have to be sensitive to the unique character of market related global environmental governance mechanisms such as the CDM, because the local level information, verification and implementation challenges are likely to be greater in developing countries.

POSTSCRIPT: Shooting at the moving target that is CDM / Kyoto

During this research, CDM rules and the context of the Kyoto Protocol have been constantly changing. When it started in July 2003, the CDM was still developing and negotiations were ongoing. There was no reason to hope or put a timeline as to when the Kyoto Protocol would come into force. So I worked basically from the Marrakesh Accords and the analysis emerging from the negotiations. As I worked, the rules metamorphosed several times but grey areas remain to date. The box below shows a timeline of the major changes during the period of the research.

These constant changes imposed a permanent cycle of countless iterations aimed at updating the analysis following the developments in rules at the global level. Keeping up to date with this evolution was a unique challenge during this study. Inevitably I had to make a decision to stop somewhere. Otherwise it would be endless, because the rules were still changing in December 2006 as I wrote the final chapters.

Two thirds into the study, as more evidence was emerging that CDMs forestry conditions are too difficult, problematic and not practical, new ideas on alternatives for land use, land use change and forestry within the UNFCCC began to emerge. Only one forestry project has been registered in the CDM today. Kagi and Schoene (2005) provide an overview of the methodological difficulties for CDM project Development.

Current ideas under discussion by UNFCCC regarding post-2012 Kyoto Protocol implementation suggest that a national, sectoral approach to forestry might be adopted, such as the concept of "Reduced Emissions from Deforestation and Degradation- REDD" which proposes the introduction of natural forest management into the Kyoto options (Santili et al., 2005). The REDD idea suggests a mechanism in which countries that elect to reduce national level deforestation to below 1980-1990 level would receive post facto compensation, whilst they commit themselves to stabilise or further reduce deforestation in the future. This means national governments taking responsibility for meeting the reduction targets through a sectoral approach. The details as regards data requirements for this type of approach are not yet clear, since indeed the policy is only at the discussion stage, but it is clear that such an approach cannot be taken without rigorous planning and monitoring data; and since the approach is nation-wide rather than at project level, it is self-evident that an appropriate national information infrastructure will be needed as soon as a country elects to be part of this mechanism.

If CDM forestry or land use and land use change forestry within the UNFCCC or Kyoto in developing countries is to be supplemented, or even superceded, in the post-2012 period by an approach such as REDD in which the whole forest sector, or even the whole land use sector of a country is treated as a unit it would widen the scope of investments in forestry. Forestry for the mitigation of climate change may no longer be afforestation and or reforestation, but also forest management and efforts to reduce rates of deforestation could be included. But such an approach brings with it massive requirements for data; border to border, continuously monitored forest inventory information would be needed so that the country could weigh forest gains in some areas against losses in others, since only the absolute gains in forest would be rewarded. Skutsch et al., (2006) point to the heavy reliance on remote sensing data for implementing Reduced Emissions from Deforestation and Degradation (REDD) in this regard. This would include serial remote sensing images from a given base period / year, land use, land cover, forest area and texture changes and ground truth data for all these categories. Thus, if REDD is adopted, meso and macro level data would become an absolute necessity for carbon forestry implementation in non-Annex 1 countries, to a much greater extent than is now the case for CDM, for which at present, meso and macro level data is seen as merely supportive.

In addition, highly detailed, systematically collected micro-data is likely to be needed, for validating remotely sensed estimates of degradation and to some extent deforestation (i.e. as ground truth) within the REDD framework in the future. Moreover, if any sort of internal reward system is to be developed, micro-level data will be needed so that incentives can be provided for the various stakeholders who are responsible for the reductions in deforestation, through a payment for environmental services system for example (Trines et al., 2006). The participatory approaches to carbon stock assessment by communities themselves, which were developed in the first instance in the context of CDM, could here be of immense importance.

My prediction is that, no matter the approach, CDM or REDD and CDM plus REDD and possibly other options that will emerge, the implementation challenges in terms of policy development, information management and institutional capacity for developing countries will stay and will need perhaps even more attention as the adverse impacts of climate change become more apparent in these countries. In conclusion, I will say that although the future of CDMs may well be at stake, the lessons from this research are also relevant for the development and implementation of future biosphere carbon mechanisms and other multi-lateral environmental agreements that contemplate similar market mechanisms.

Timeline of Key CDM Forestry Decisions during this study

July- 2003:	Research start date
December 2003:	Modalities and Procedures for Afforestation and Reforestation Activities under the CDM (Decision 19/CP.9)
December 2004:	Simplified Modalities and Procedures for Afforestation and Reforestation Activities under the CDM in the first commitment of the Kyoto Protocol and measures to facilitate their implementation (Decision 14/CP.10).
February 2005:	Kyoto Protocol becomes law on February 16
June 2005:	Draft tool for the demonstration of additionality in A/R CDM Projects (Annex 1 of the CDM AR WG Fourth Meeting Report)
November 2005:	Procedures to define the eligibility of lands for afforestation and reforestation project activities (Annex 16 of CDM EB 22 Report)
Mid 2005:	Emergence of "Reduced Emissions from Deforestation and Degradation- REDD" as an alternative to CDMs
December 2006:	Further guidance relating to the CDM (Decision -/CMP.2)

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Summary

Many African countries are seriously lagging behind in the development of projects within the Clean Development Mechanism (CDM) of the Kyoto Protocol. The CDM was developed to allow developed countries to invest in energy and forestry projects in developing countries that will enable the former meet their Kyoto Protocol targets whilst benefiting sustainable development in host countries (developing countries). But the CDM was negotiated through a lengthy multilateral process in which poor developing countries were under-represented, therefore little attention was paid to local realities in the countries in which these projects are implemented. Yet, little research attention has been given to empirically explaining the "implementability" of globally negotiated environmental policy such as the CDM in Africa or indeed elsewhere in the world. This study attempted to make a contribution in this respect by analysing CDM forestry modalities vis-à-vis local realities in Cameroon, as an example.

This thesis argues that international environmental policy such as the CDM would have to go through a filter of national and possibly regional level policy mediation to get to the operational level where projects are implemented. Successful implementation is thus dependent on policy, institutional capacity, and information management realities at multiple levels – i.e. national, sub-national and project levels. The state of development in these variables at various levels would determine how they drive or constrain the implementation of such policies. The proposition is that some minimum degree of synergy in policy, institutional capacity, and knowledge and information is required across the global, national, sub-national and community level for any successful project implementation.

As a corollary, a multi-dimensional and multi-scale analysis of the influence of local realities is done in this study. This is done in two parts. In part I, the study looks at the compatibility between global and national forest policy (chapter 2); this is followed by an analysis of the global-level forest and land use policy information demands versus the national, sub-national and local level information supply capacities respectively (chapter 3); and lastly the global CDM policy requirements versus the overall planning and management capacity of local communities (chapter 4). In part two of the study (Chapters 5 and 6), a number of Participatory Geographic Information System (PGIS) tools are examined as one route to meeting the challenges of project creation that emerge in part one.

The analysis is based on the CDM project criteria and conditions specified in various decisions of the Conference / Meetings of Parties to the Kyoto Protocol and the CDM Executive Board. The main criteria include, additionality (investment, financial, programme), eligibility of forest land, acceptability,

externalities (impacts and leakage), and certification. A diverse set of methods is used in various chapters including policy sciences, information sciences, institutional analysis and spatial information sciences.

The following findings and conclusions emerge:

Compatibility between global and national forest policy: Based on a framework derived from CDM policy requirements of national policy, some supportive and constraining factors were identified. Supportive regulatory institutional factors in Cameroon included the creation of a Designated National Authority, the development of a project review procedure and the definition and the development of sustainable development criteria for CDM project review and approval at the national level. Constraining factors included the inadequacy of the current definition of forest for CDM purposes, ambiguous land tenure and forest resource revenue rights and entitlements, lack of rules or regulations for impact assessment and on genetically modified organisms and invasive species, and the absence of a definition of poor communities or individuals for small-scale CDM project eligibility. It was also found that the current scope for the definition of forests within CDM rules is unfavourable for Cameroon. Choosing any value of between 10-30% of crown cover for forest eligibility under the CDM would automatically eliminate about 60% of Cameroon's forest. Proactive policy measures are thus needed for Cameroon to increase CDM forestry uptake.

Adequacy of forestry data infrastructure: Judging from a CDM conceptual data model developed during this study, the study confirms from a demand and supply analyses (i.e. from a conceptual data model and an inventory of forest and land use data), that data availability and the relevant infrastructure for data or information generation is inadequate for supporting carbon forestry at the micro, meso and macro levels in Cameroon. These results suggest that current CDM afforestation and reforestation information demands are almost insurmountable for local communities in host countries and pose a number of cross-scale barriers to project adoption. More importantly, proactive regulatory, institutional and capacity building policy strategies for forest data management improvements that could enhance biosphere carbon management uptake in poor countries are identified.

Local community capacity for CDM project planning and management: The study used relevant aspects of the Clean Development Mechanism criteria and notions of "community capacity" to elucidate determinants of community capacity needed for CDM implementation within community forests. Main requirements are for community capacity to handle issues of additionality, acceptability, externalities, certification and community organisation. These community capacity requirements are further used to interpret empirically derived insights on two community forestry cases in Cameroon (namely- Tinto and Bimbia Bonadikombo). While local variations were observed for capacity requirements in each case, community capacity was generally found to be insufficient for meaningful uptake and implementation of Clean Development Mechanism projects. Implications for understanding factors that could inhibit or enhance community capacity for project development are discussed. Recommendations are made for the wider Clean Development Mechanism / Kyoto capacity building framework.

Participatory GIS potential: A method for eliciting local knowledge in which participatory rural appraisal and GPS surveys were jointly used was compared to land use maps derived from satellite images to examine reliability and the valued added for supplying forest eligibility information within the CDM. An overlay of points from local recollection of forest cover for 1980 and 1990 in the Bimbia Bonadikombo community forest in Cameroon and land cover maps of the same periods and area showed a match of between 51% and 70 %. Though PGIS added value to local knowledge in terms of form, content and quality, evidence from comparing PGIS point maps to land use maps generated from satellite images was merely moderately convincing on reliability of PGIS use for CDM eligibility. The main argument is that PRA and remote sensing should be seen as complementary evidence for CDM eligibility, rather than PRA being considered inferior to remote sensing data as current CDM rules indicate.

An ongoing PGIS process in the same community was also assessed in terms of its potential for mitigating the intricacies of common property regimes, land and resource tenure issues and rule making and implementation that impede community carbon forestry development. Using a set of good governance criteria and indicators, PGIS processes were found to reasonably supply spatial information requirements for CDM forestry such as land eligibility, project boundary, baseline development (i.e. additionality) and land ownership and entitlements. Secondly, PGIS and P-mapping processes also contributed – positively, though not comprehensively to good governance, by improving dialogue, redistributing resource access and control rights- though not always equitably, legitimizing and using local knowledge and some empowerment through training and decision-making. PGIS was found to harbour tremendous potential for providing CDM project validation and certification evidence as they are valuable, appropriate and practical for data scarce and technically-poor developing country environments.

The last chapter elaborates and discusses a set of cross-scale enabling conditions or factors for CDM forestry implementation. The conditions as derived from this study are: regulatory compatibility, institutional synergy, information availability, complementary capacities and governance mechanisms or frameworks. For a successful implementation of CDM policy at macro, meso and micro levels there is need to actively promote or make good potential driving factors and or actively ensure that constraining factors are checked at all levels. The study closes with a more general reflection on whether these enabling conditions are specific to the CDM and whether or not they are also relevant for the implementation of other international environmental agreements. More importantly, I also briefly sketch the implications for current thinking in multi-level global environmental governance.

Samenvatting

Weinig Afrikaanse landen maken daadwerkelijk gebruik van de mogelijkheid projecten voor te stellen in het kader van het "Clean Development Mechanism" (CDM) binnen het Kyoto Protocol. De bedoeling van het CDM is om geïndustrialiseerde landen de mogelijkheid te geven te investeren in bosbouw en energie projecten in ontwikkelingslanden. Hiermee worden de geïndustrialiseerde landen in de gelegenheid gesteld om hun "Kyoto doelstellingen" te halen terwijl tegelijkertijd de gast landen van die projecten kunnen profiteren van duurzame ontwikkeling (*sustainable development*). Het CDM kwam echter tot stand in een tijdrovend multilateraal proces waarbij de ontwikkelingslanden ondervertegenwoordigd waren. Hierdoor werd er in dit proces (te) weinig aandacht besteed aan de lokale omstandigheden waarin de projecten worden geïmplementeerd. Over het algemeen is er weinig empirisch onderzoek gedaan naar de "implementeerbaarheid" van wereldwijd overeengekomen milieubeleid, zoals het CDM. Deze studie tracht hieraan een bijdrage te leveren door een analyse te maken van de modaliteiten in het CDM voor de bosbouw en die te vergelijken met de lokale omstandigheden in Kameroen.

Deze studie laat zien dat internationaal milieubeleid zoals het CDM door een filter van nationale en regionale beleidsaanpassing moet gaan om op het operationele niveau van de lokale projecten te worden geïmplementeerd. Succesvolle implementatie van dergelijk beleid is daardoor afhankelijk van ondersteunend beleid, institutionele capaciteit en de praktijk van informatie beheer op meerdere niveaus – namelijk nationaal, subnationaal en project niveau. De mate waarin deze factoren op de verschillende niveaus ontwikkeld zijn, zou dan bepalend zijn voor de mate waarin zij sturend ofwel beperkend zijn in de uitvoering van internationaal milieubeleid. Gesteld kan worden dat een bepaald minimum aan synergie in beleid, institutionele capaciteit, kennis en informatie tussen de verschillende niveaus nodig is voor succesvolle uitvoering van projecten.

In deze studie wordt een meerdimensionale analyse gedaan op meerdere niveaus van de invloed die de lokale omstandigheden hebben. Deze analyse wordt in twee delen uitgevoerd. In deel 1 wordt allereerst gekeken naar de mate waarin het internationale en nationale bosbeleid op elkaar aansluit (hoofdstuk 2). Vervolgens wordt nagegaan welke informatiebehoefte op wereldniveau bestaat voor bos- en landgebruikbeleid door een analyse van de capaciteit die er op lagere niveaus (nationaal tot lokaal) is om aan deze informatiebehoefte te voldoen (hoofdstuk 3). Dit deel eindigt met een analyse van de mate waarin de algemene planning en management capaciteit op lokaal niveau aansluit op de CDM vereisten (hoofdstuk 4). In deel 2 van de studie (hoofdstuk 5 en 6) wordt een aantal participatieve geo-informatie technieken

(PGIS) besproken die kunnen dienen om de het eerste deel geschetste uitdagingen voor projectuitvoering op lokaal niveau aan te gaan.

De analyses zijn gebaseerd op de CDM criteria en voorwaarden die zijn vastgelegd in de verschillende besluiten van de Conferenties en Vergaderingen van de Partijen in het Kyoto Protocol (COP/MOP) en het Uitvoerend CDM Comité. Belangrijke criteria hierin zijn onder andere, toegevoegde waarde (*additionality*), geschiktheid (*eligibility*) van bosgebied, aanvaardbaarheid (*acceptability*), externe invloeden (*externalities*) zoals (milieu) effecten (*impacts*) en lekkage (*leakage*), en certificering. Uiteenlopende methoden uit de bestuurskunde en (ruimtelijke-) informatiewetenschappen worden toegepast in de verschillende hoofdstukken.

De studie levert de volgende conclusies en bevindingen:

Aansluiting tussen wereldwijd en nationaal bosbeleid: Gebaseerd op een raamwerk van nationale vereisten op het gebied van CDM beleid zijn enkele beperkende en bevorderende factoren geïdentificeerd. Bevorderende institutioneel regulerende factoren in Kameroen zijn onder andere het creëren van een "Designated National Authority" (DNA), de ontwikkeling van een project evaluatie procedure en de definitie van criteria voor duurzame ontwikkeling voor die evaluatie en de goedkeuring van projecten op nationaal niveau. Beperkende factoren zijn ondermeer de ontoereikende definitie van bosgebieden voor CDM doeleinden, dubbelzinnigheid met betrekking tot rechten op grondbezit en aanspraak op opbrengsten uit de bossen, gebrek aan regelgeving voor (milieu) effect rapportages en voor genetisch gemodificeerde organismen en invasieve soorten, en de afwezigheid van een definitie die bepaalt wanneer en hoe de lokale bevolking voor een CDM project in aanmerking komt (*eligibility*). Een andere bevinding is dat er binnen de huidige CDM regelgeving geen ruimte bestaat voor een goede definitie van bosgebieden in Kameroen. Een keuze binnen het CDM voor een bedekkinggraad ergens tussen 10% en 30% heeft als onmiddellijk gevolg dat ongeveer 60% van de bossen in Kameroen niet meer in aanmerking komen. Een proactief (internationaal) beleid is dus gewenst om in Kameroen een grotere deelname aan CDM bosbouw te bewerkstelligen.

Geschiktheid van de bosbouw data-infrastructuur: Gebaseerd op een conceptueel CDM datamodel dat gedurende deze studie is ontwikkeld, kan vanuit het oogpunt van een vraag en aanbod (data) analyse gesteld worden dat de beschikbaarheid van data en de benodigde infrastructuur om deze data of informatie te genereren onvoldoende is om CDM bosbouw in Kameroen op nationaal, regionaal en lokaal niveau te kunnen ondersteunen. Deze resultaten suggereren dat de huidige CDM bosbouw informatie eisen op lokaal niveau in gastlanden praktisch onhaalbaar zijn en barrières opwerpen voor project uitvoering. Daarom is het belangrijk dat strategieën worden geformuleerd voor een proactief en regulerend beleid dat er op gericht is bosbouw datamanagement te verbeteren en er toe kan leiden dat de adoptie van CDM (*carbon management*) op biosfeer niveau toe neemt in ontwikkelingslanden.

CDM project planning en management op lokaal niveau: Deze studie heeft gebruik gemaakt van relevante aspecten van de CDM concepten en criteria met betrekking tot "lokale capaciteit" om de factoren te verduidelijken die doorslaggevend zijn bij CDM implementatie op lokaal niveau (*community forestry*). Voorwaarde is dat op lokaal niveau de capaciteit bestaat om de eerder genoemde CDM criteria (*additionality, acceptability, externalities, certification*) toe te passen en dat hiertoe binnen de gemeenschap een zekere mate van organisatie bestaat. Deze lokale capaciteitsvoorwaarden zijn verder gebruikt om de empirisch verkregen inzichten van twee (*community forestry*) case studies in Kameroen te interpreteren (Tinto en Bimbia Bonadikombo). Terwijl de capaciteitsvoorwaarden lokaal varieerden voor elke case, bleek over het algemeen de lokale capaciteit onvoldoende om CDM projecten zinvol te kunnen implementeren. De implicaties van factoren die de locale capaciteit kunnen vergoten of verkleinen worden besproken. Aanbevelingen worden hierover gedaan voor CDM en in brede zin voor het raamwerk van capaciteitsontwikkeling binnen het Kyoto protocol.

De mogelijkheden van Participatieve GIS technieken (PGIS): Om de betrouwbaarheid en toegevoegde waarde te onderzoeken van informatie toelevering met betrekking tot geschiktheid van bosgebieden binnen CDM (*eligibility*) werd een methode gebruikt waarbij lokale kennis met bestaande kaartinformatie werd vergeleken. Dit werd aan het licht gebracht door PRA (*Participatory Rural Appraisal*) en GPS verkenningen te vergelijken met landgebruikkaarten die uit satellietbeelden waren vervaardigd. Kaarten met puntlocaties die gemaakt werden met kennis uit overlevering van de dichtheid van het Bimbia Bonadikombo bos in Kameroen in 1980 en 1990 bleken in vergelijking met landgebruikkaarten uit diezelfde periode voor 51% tot 70% overeen te komen. Ondanks dat PGIS van toegevoegde waarde is voor de lokale kennis (*local knowledge*) door er een andere vorm en inhoud aan te geven, levert de vergelijking van de PGIS kaarten met de uit satelliet beeldmateriaal vervaardigde kaarten slechts een matig overtuigend bewijs dat PGIS op zich zelf bruikbaar is om geschiktheid voor CDM projecten aan te tonen. Het belangrijkste punt is de erkenning dat PRA en aardobservatie beide aanvullende bewijzen voor CDM geschiktheid kunnen leveren, in plaats van dat PRA als inferieur gezien word aan aardobservatie, zoals momenteel het geval is in CDM reguleringen.

Een lopend PGIS proces in dezelfde gemeenschap werd ook beoordeeld op het potentieel om de complexiteit van systemen van gemeenschappelijk eigendom, beschikkingsrecht over hulpbronnen en regelgeving die de totstandkoming van "community carbon forestry" in de weg staan te verminderen. Door gebruik te maken van een set criteria en indicatoren voor verantwoord bestuur (*good governance*) kwamen verschillende PGIS processen aan het licht die redelijk voldeden aan de ruimtelijke informatie eisen van de CDM bosbouw. Het betrof ondermeer de eisen voor land geschiktheid, project begrenzing, "baseline" bepaling, en land rechten en eigendom. Daarnaast droeg het PGIS en participatieve karteringproces in zekere mate positief bij aan verantwoord bestuur door de dialoog te verbeteren en te zorgen voor (deels) een herverdeling van rechten en toegang, en een legitimering van de lokale kennis door deze te gebruiken in training en besluitvorming. PGIS bleek een groot vermogen te hebben om bewijs te leveren bij het valideren en certificeren van CDM projecten in ontwikkelingslanden, omdat het nuttige en praktische mogelijkheden biedt in gebieden waar weinig gegevens en technologie voor handen zijn.

In het laatste hoofdstuk wordt uitgewijd over een aantal schaal doorkruisende voorwaarden die CDM bosbouw mogelijk maken. Uit deze studie komen de volgende voorwaarden tevoorschijn: verenigbaarheid met de voorschriften, institutionele synergie, beschikbaarheid van informatie, aanvullende capaciteiten en bestuursmechanismen of raamwerken. Om een succesvol CDM beleid te bewerkstelligen op nationaal, regionaal en lokaal niveau is het noodzakelijk dat er een actieve sturing en stimulering is en dat op alle niveaus de beperkende factoren bekend zijn. Deze studie besluit met een meer algemene beschouwing of deze voorwaarden specifiek zijn voor CDM of dat zij ook relevant kunnen zijn bij de implementatie van andere internationale overeenkomsten op natuur- en milieugebied. In een korte schets wordt benadrukt wat de gevolgen hiervan kunnen zijn voor het huidige denken op de verschillende niveaus binnen de wereldwijde natuur en milieubeleidsbepaling.

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