

Land Administration for REDD+ and Voluntary Carbon Market Projects

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SUMMARY

This paper outlines the potential role and requirements for land administration in the context of payments for environmental services (PES) as part of climate change mitigation projects. The discussion covers the potential land issues on PES schemes operating in settings with legal pluralism and overlapping and conflicting claims and use of land, the land tenure information required for projects related to carbon sequestration, be it through reforestation, afforestation or preventing of deforestation or forest degradation, or even improved agricultural land use, and the land administration options available.

The requirements for carbon accounting are discussed and three case studies are explored to consider how beneficiaries are determined and property rights recorded during the project implementation. A review of innovative land administration practices and tools is instructive in considering which approaches may be applied to PES projects. The discussion considers the range of alternatives available for recording and certifying property rights on private, state and communal land, including in situations where rights to land and other resources overlap spatially or temporarily, and where social tenures exist.

The authors conclude that protecting the property rights of project beneficiaries is a critical component of PES projects, be it at an individual or community level. Elements of existing approaches to recording rights on private, state and customary lands are suitable for implementation on such projects. It is desirable that land administration forms an integral part of an integrated system for carbon accounting and reporting and the implementation of PES projects. Experience shows that decentralized land administration and effective community consultation are key elements to the protection of property rights, and that a significant investment in capacity building of land administration and customary agencies is required to improve sustainability, to reduce the likelihood that PES schemes will be at the detriment of vulnerable groups or whole local communities.

Land Administration Options for Projects Involving Payments for Carbon Sequestration

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1. INTRODUCTION

Climate change mitigation mechanisms have been created for payments for carbon offsets in developing countries, and especially in forest and related rural areas. The increased or secured carbon sequestration these mechanisms aim at can only be realized when current land use is changed, improved or prevented from increasing depending on the scheme. This can only be done by the people that - on the ground- are using the land and forest, and it might have an impact on their livelihoods. Insuring maximum effect of payments as well as avoiding loss of livelihoods implies clear knowledge of *de jure* and *de facto* land rights.

The Clean Development Mechanism (CDM) is one of number of carbon markets that provides carbon offsets as a financial reward for carbon sequestration. The CDM allows developed countries to implement projects in developing countries that provide emission reductions greater than would have occurred otherwise to earn saleable certified emission reduction (CER) credits which can be counted towards meeting Kyoto targets. CDM Projects are limited to reforestation/afforestation projects. Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) include reforestation/afforestation projects, and REDD+ also includes sustainable forest management. Carbon accounting is usually undertaken at the national level and the national government develops the legal and policy mechanisms. At a smaller scale carbon sequestration activities can lead to carbon offsets in government instituted markets and Voluntary Carbon Markets (VCM).

These initiatives put pressure on the access to forest lands, especially for local communities currently using them. The issue of protecting the access to forested lands is not new. The Rights and Resources Initiative (2008) noted the inadequate recognition of human rights, and stated “Many forested communities, particularly in developing countries, are chronically poor and badly governed. They suffer disproportionately from conflicts, humanitarian crises and corruption, which often then spread nationally and internationally”.

Under Article 17 of the *Universal Declaration on Human Rights* every person has the fundamental right to own property, and no one shall be arbitrarily deprived of property. The *United Nations Declaration on the Rights of Indigenous Peoples* reaffirmed the importance of the protection of indigenous property rights in Articles 25-29. This is important to REDD+ and VCM projects as many PES programmes are implemented on customary or indigenous lands over which the land tenure and rights to resources are complex and informal. It has been estimated that 71% of forested lands are administered by government (White and Martin, 2002) and 9% by communities (Sunderlin, 2007). These figures represent the statutory situation and millions of people live in and depend on “state” forests. As Hatcher (2009) noted “Resource rights are almost always contested, and initiatives to legally recognize

resource tenure are often highly political with context specific complications and complexities”. Conflict over claims to land and resources places the potential beneficiaries of land use payments vulnerable to exploitation by powerful interests (elite capture), and reduces the incentive to undertake improved land management practices. Unruh (2008) described five features of African land tenure systems that are problematic for PES projects: (i) a pervasive disconnect between customary and statutory land rights, (ii) legal pluralism, (iii) planting trees with the aim of claiming land, (iv) large scale expansion of tree areas on smallholder land, and (v) lands targeted by PES projects considered abandoned but in reality customary lands. He argues that there are frequently a set of assumptions about tenure in Africa that are often markedly different to the *de facto* complexity that exists on the ground.

Clarity of tenure relationships is fundamental to secure and transparent transactions for payments for climate change mitigation work. Clarity of tenure implies a strong understanding of all existing claims to land and to the carbon, and the enforcement of these claims. However, in most settings these claims exist in a system of legal pluralism and include a mix of formal *de jure* rights recognised by the legal framework, and informal (but socially legitimate) *de facto* rights to land recognised by the local communities and based on complex cultural norms. Ignoring either the *de jure* or *de facto* rights is one of the main reasons for conflict over land and resources. Recognition and recording of the full extent of rights to land and to carbon is a complex process and should not be underestimated.

The aim of this paper is to outline the potential role and requirements for land administration in the context of payments for environmental services (PES) as part of climate change mitigation projects. This paper is based on a comprehensive literature review and the approaches taken in recording interests in land and natural resources on two VCM and one REDD project, in Indonesia, Brazil and Indonesia. These case studies demonstrate that there are similarities in approaches based on the respective guidelines for reporting used. The discussion covers the potential land issues on PES schemes operating in settings with legal pluralism and overlapping and conflicting claims and use of land, the land tenure information required for REDD+ and VCM Projects, and the land administration options available to document and protect those.

2. REQUIREMENTS FOR LAND ADMINISTRATION ON REDD+ PROJECTS

The 2006 Intergovernmental Panel on Climate Change (IPCC) *Guidelines for National Greenhouse Gas Inventories* provides guidance for carbon accounting in the Agriculture, Forestry and Other Land Use (AFOLU) Sector (i.e. CDM, REDD and REDD+), and the IPCC *Good Practice Guidance for LULUCF* (Land use, land-use change and forestry) are similar and provide guidance for land use, land-use change, and forestry projects. Both guidelines require land cover to be mapped and carbon counted in six broad categories of land (Forest land, Cropland, Grassland, Wetlands, Settlements, and Other land). Three generic approaches are recommended: (i) use existing government datasets to identify the total parcel area (may not be spatially explicit or georeferenced), (ii) a national or regional survey of land-use and land use change, and to identify where land use has changed categories (may not be spatially explicit) and may be extrapolated as a ratio of the total area or population, and (iii) spatially

explicit data collection of land area, land use and land-use change. This last method allows land-use conversions to be tracked on a spatially explicit basis. In areas where there is limited technical capacity the method of spatially referencing the data will involve the collection of data in the field based on a spatially referenced grid (perhaps using GPS). An important consideration is that the buyers of reduced emissions will seek assurances that the accounting is accurate, reliable and close to real-time. FAO/UNDP/UNEP (2008) noted that remote sensing techniques had been widely tested and were recommended as a tool for REDD monitoring, assessment and verification, but stated that it was more feasible for some ecosystem and land use, and carbon accounting approaches than others. In the discussion that follows we discuss the use of remote sensing in the case study projects and the likely importance of remote sensing to land administration on projects.

Under the CDM guidelines the *Procedures to demonstrate the eligibility of lands for afforestation and reforestation project activities* require that project participants demonstrate the eligibility of projects by providing information to demonstrate that the amount of vegetation on the land is within the CDM criteria, and that the proposed activity is consistent with Afforestation/Reforestation guidelines. Spatial information such as aerial photographs or satellite imagery complemented by ground reference data; or land use or land cover information in digital or paper form; or from ground based surveys is recommended to support this process. Also additional information such as land use or land cover information from permits, plans, or information from local registers such as a cadastre, or other land registers may be useful (van der Molen, 2009).

A review of the literature indicates that the discussion on how to record property rights on REDD+ and VCM projects is at a very preliminary stage. While the land administration literature contains many examples of different approaches to recognizing and recording rights to land and natural resources, the challenge is to understand what will work in a PES setting. If property rights are not fully understood and accepted the likelihood of conflict increases, and the more vulnerable are further exposed to exploitation. As discussed throughout this paper, rights to natural resources are almost always contested, and this is especially the case where the natural resources have a significant market value. The first issue to be established is the identity of the major stakeholders and potential beneficiaries of the PES payments. Payments are made to the land managers who may or may not have legal property rights. Therefore it is important to establish not only who owns or has the most legitimate rights to use the land, but also who has the rights to the carbon stock? In many cases the rights to trees or other natural resources may act as a practical proxy for carbon rights (Barnes and Quail, 2010). It will be important to establish whether the trees are the property of the community, the government, or some third-party concessionaire (Barnes and Quail, 2010). Another question to be asked is does tenure of trees necessarily mean tenure of carbon? Especially when carbon rights will be traded by commercial companies, accountancy standards might demand highly formal documentation of all aspects including property rights.

In some circumstances projects cover lands where there are overlapping rights or communal rights. In these circumstances a thorough and participatory process is required to fully understand the specific rights to carbon (or another single resource – e.g. a tree as a proxy for

the carbon). Also, existing land use practices may involve migration between seasons, and possibly a temporal overlap in the use of land between different individuals or families or groups. A further complication is that rights to trees or rights to carbon may also come with ancillary rights such as the right to use an access path to the natural resource in question, which may be for the sole use of the person with rights to the resource, or may be a shared. The means of access is critical to the implementation of works to improve carbon levels. The complication is where the PES scheme involves the need for access to an allocated piece of land for an activity such as reforestation. It could be that there are common or overlapping rights to access lanes to get to the parcel to be reforested, or afforested (Mitchell, 2010).

Childress (2010) argues that the depiction of all potential property rights “is presumably a prerequisite for the type of detailed land management schemes which are expected to provide clarity and security for REDD schemes”. Also important for the sustainability of records of property rights is that the rules with respect to transferability, inheritance, extinction, subdivision, etc. of carbon property rights are clear and generally accepted. Barnes and Quail, (2010) argue that “beyond the specific information content in a carbon cadastre, it is essential that this cadastre serve as a vehicle for publicizing carbon property rights in as transparent and accessible manner as possible. It should not be used as a mechanism for asserting national control and may best operate below the national level”.

3. EXISTING APPROACHES

It is instructive to review completed and existing REDD and VCM projects to establish the approaches taken to administer interests in land and determine which beneficiaries are eligible for payments, and how disputes were resolved. The following discussion reviews the approaches taken on three projects – the Ulu Masen Project in Indonesia, the Juma Reserve REDD project in Brazil, and the Sofala Community Carbon Project in Mozambique.

3.1 The Ulu Masen Project, Indonesia

This VCM project covers 750,000 ha of forest in the Ulu Masen Ecosystem and adjacent areas in Aceh Province and involves payments for land use planning, reforestation, restoration, and sustainable community logging. Recent Government of Indonesia legislation (Government Regulation PP6/2007) authorizes provincial and district governments to issue IUPJL licenses (Permit for Ecological Service Utilization) for storing and absorbing carbon in forests, and was implemented to enable reforestation projects to claim carbon credits (PGNAD, 2007). It was not intended that this project will require involuntary relocation of people or communities. A potential for migration into the project area was identified, particularly if there is an obvious improvement in livelihoods, however the local communities are considered to have the ability to deter significant in-migration (PGNAD, 2007).

Approximately 130,000 people live in adjacent communities or villages with common ethnic and cultural backgrounds (called a *Mukim*). Local *Mukim* leaders regard adjacent forest lands as belonging to the community and are managed by the *Mukim*. However, there are an estimated 2,000 to 3,000 villagers participating in illegal logging (PGNAD, 2007). The

project aims to reduce conflict over land and resources by “involving communities and Mukim leaders in participatory land use planning processes, establishing jointly agreed boundaries and land use patterns, and developing a multi-stakeholder management structure. Prior informed consent based on customary land tenure arrangements and resource access rights of local communities must be sought prior to the establishment of carbon forests or other substantive changes in land use” (PGNAD, 2007). The project design allows for forest land demarcation but it is unclear what methods will be used for surveying or identifying and agreeing on the boundaries. Identification of beneficiaries and the disbursements of grants are to be through Mukim leaders and other structures established under the World Bank Multi-Donor Fund’s Aceh Environment and Forest project (AFEP). Adjudication of boundaries will also follow this process. Remote sensing and radar imagery is to be used to monitor deforestation rates and changes in land cover, although details of how this is to occur are limited (PGNAD, 2007).

3.2 The Juma Reserve REDD Project, Brazil

The Juma Sustainable Development Reserve Project for Reducing Greenhouse Gas Emissions from Deforestation (“Juma Reserve REDD Project”) aims to address significant deforestation in the Juma Sustainable Development Reserve in the State of Amazonas. The 589,612 ha Reserve was created in 2006 over an area at high risk of deforestation and over forests with high conservation values, and aims to prevent the deforestation of about 329,483 hectares of tropical forests (Banco de Planeta *et al*, 2008). Under this REDD program direct payments for environmental services will be made under the *Bolsa Floresta Program* which grants financial compensation for the forest conservation services provided by the traditional and indigenous populations. Payments include a monthly stipend to mothers of families, a Forest Conservation Allowance for residents’ associations, a yearly grant for each community, and grants for community infrastructure. The majority of the families living in the Juma Reserve did not have land titles or personal documentation. A preliminary evaluation found that there were approximately twenty private land title claims covering 15,038 hectares, and many of these properties lacked documentation, or were acquired illegally. A participatory process was used to identify and map interest in land and resources, that included mapping cleared land and abandoned land, zoning areas in use, and determining the impact of use on carbon stocks. In 2005, a field excursion undertook socio-economic and ethno-characterization surveys, mapped the natural resources and archaeological sites and conducted a land information survey. A 2008 social inventory questionnaire estimated there were 339 families living in 35 communities within the Reserve and surrounding area. Demarcation of project boundaries was not critical as the reserve was bounded on three sides by rivers. The Project Design Document includes several land use maps prepared resulting from satellite imagery and refers to the publicly available information from the *Program for the Estimation of Deforestation in the Brazilian Amazon (PRODES)*, which maps and estimates changes to deforestation in the Brazilian Amazon (Banco de Planeta *et al*, 2008). The project design also allowed for the definition and regularization of these private lands.

3.3 The Sofala Community Carbon Project, Mozambique

In 1948 the Gorongosa National Park was created resulting in the displacement of people to a buffer zone surrounding the park. In the buffer zone hunting and gathering was allowed only for subsistence purposes. Fighting during the 16 year civil war around Gorongosa National Park had a huge impact on both the forests and the forest communities. After the war ended many people moved back to the buffer zone area and became involved in agriculture. A survey in 2004 found that there were 1039 people in 245 families living in the Sofala *Regulado* part of the buffer, with the families living in widely scattered homesteads involved mainly in small-scale shifting cultivation agriculture that was mainly subsistence in nature with most work being done manually (University of Edinburgh, 2008).

The Sofala Community Carbon Project aims to promote the adoption of agro-forestry or forestry system mitigation activities in communities within the buffer zone, and sequester carbon through the planting of indigenous and fruit tree plants. This VCM project works with rural smallholders under the Plan Vivo system, and in 2007, 485 farmers were involved. The project is bounded on three sides by consists of protected areas (under state administration but managed by a non-profit foundation), a buffer zone immediately adjacent to the Park boundary (jointly managed by the government, communities and other stakeholders), and community land. The community undertook the delimitation of its land and all bordering community lands in 2003 using Community Land Delimitation - a process developed in Mozambique and prescribed in law by the Technical Annex within the Land Law Regulations (De Wit and Norfolk, 2010). Co-title has been secured to the communally-occupied areas and land is registered in the name of the community. Within the delimited areas, the communities are responsible for land and resource management (De Wit and Norfolk, 2010).

3.4 Information systems used for natural resource monitoring

It is also useful to look for lessons from land administration systems used to record land use associated with natural resources management activities. In order to improve the recognition of property rights and forest ownership and access to forest lands, documentation is necessary, and should ideally be linked to land administration, without necessarily implementing for full titling. In one of the most extensive examples, the European Union *Integrated Administration and Control System* (IACS) aims to ensure that correct payments are made to farmers and that there is traceability of payments. Each Member State must have a cadastre for agricultural land showing who farms it, that records land use rather than land tenure, to administer the payment to farmers. This requires the creation of a Holding Register that identifies each parcel of agricultural land, its size, and who can claim the payments. In each country the IACS typically comprises a *Land Parcel Identification System* (LPIS) based on cadastral maps, spatial data, aerial photography, or satellite imagery (Inan *et al*, 2010). The system must be able to identify whether a claim is legitimate, and that multiple claims are not being made for any parcel. As land can be transferred between farmers and agricultural land parcels may be joined together or divided, the system must be able to update the Register without compromising the integrity of the data. The FAO (2006) argued that there would be benefits in developing the IACS system to include a land tenure database.

In another example in Mato Grosso, Brazil, a deforestation change detection technique called *Systema de Alerta de Desmatamento* (SAD) was developed based on daily image composites from Moderate Resolution Imaging Spectroradiometer (MODIS), validated by high resolution satellite images. Private landholdings were required to register in the State Environmental Licensing System of Rural Properties (SLAPR), however only 21% of the territory is registered under SLAPR. The Legal Reserve Law stipulates that the amount of deforested area in each property cannot exceed 20%. The SAD system was able to track daily changes in forest cover by detecting changes in the daily image composites, and was matched with data from the rural property cadastral and licensing database, and other GIS datasets from the State Environment Agencies, to identify and prosecute the landholders responsible. Through this process they found that most of the deforestation in Mato Grosso was on rural properties not registered under the SLAPR system. A further result has been information useful for publication by the media placing pressure on government to act against illegal deforestation (de Souza *et al*, 2010). Lessons from these examples for PES projects include the benefits of recording both land use and land tenure, and the need for effective coordination between land and natural resources agencies.

4. DISCUSSION

There is some consistency in the approaches taken on the case study projects discussed earlier. Each contained areas of informal tenure and resisted the involuntary resettlement of people (although this is not always the case). Also each sought to involve local communities in decisions on interests in land and project beneficiaries through customary elders, or local institutions. Mapping and demarcation of project, group and individual interests was undertaken using various techniques. This section discusses land administration systems operating in developing countries in their range of formats and complexities and which systems we expect to be successfully applied in REDD+ or VCM project contexts. Although systematic land titling programmes were implemented in many developing countries over the last three decades, they cover only a small percentage of the total land. However, sporadic land titling has at times been used for villages in rural areas to support large infrastructure or development projects. In circumstances where there are existing land titling programmes in the country, the cost of implementation in areas covered by REDD+ and VCM projects could be justified. Typical cost estimates for land titling range from US\$20 to US\$60 per parcel (urban) and represent a small percentage of the cost of implementation of PES schemes (Hatcher, 2009). Barnes and Quail (2010) argue that “REDD cannot wait 20 years for systematic titling efforts to cover the country or even province/state”. Lavigne Delville (2010) argued that two important issues must be considered in the choice of systematic land titling programmes: (i) whether the rights to be recognised comprise a private property model, and (ii) whether there is a need to first understand the complexity of local rights and cultural norms. He also asked “Are systems to administer these rights capable of ensuring reliable management of these complex registered rights and can land management bodies take into account the local diversity of rights?”

There is also the question of the nature of rights to be registered. Alden Wily (2003) provides a summary of the nature of rights registered in selected African countries including the entitlements (e.g. the right or ownership, or of customary occupancy), whether it may be issued to a family or community, and also the details of rights of sale, rental, inheritance, and subdivision.

Where comprehensive land titling programmes are not appropriate, other options have been developed for securing land rights on private, state and customary lands. During the 1990s many countries developed pilot systems that recorded customary rights in land with varying levels of success. In West Africa Rural Land Maps (*Plans Fonciers Ruraux – PFRs*) were used to record customary and complex rights to land and resources. This involved a bottom-up consultative approach including discussions with all stakeholders to determine the *de facto* rights. In another example the Solomon Islands introduced the *Customary Records Act 1992* that allowed for the recording of customary interests in land, although this was not implemented at the time. There have been various attempts at registering customary or communal lands as a single parcel with rights to the land in favour of a recognised community group - for example, in Uganda, Malawi, Ivory Coast (Alden-Wily, 2003).

In the 2000's many African countries changed their land legislation and institutional arrangements to allow decentralization and innovation in land administration systems (Deininger *et al*, 2006)). In many countries low-cost land registration approaches have been piloted or implemented that seek to reduce costs through decentralization of land administration, using handheld GPS or local labour and equipment for field surveys, using imagery as an alternative to field surveying, and the implementation of the computerization of land records to improve efficiency in updating records. A range of low-cost alternatives for certification have been developed and Alden-Wily (2003) provides a comprehensive review of the experiences in Africa and argues that a common aim has been to capture as many rights as possible, based on decentralization and low cost methods. This is also instructive for REDD+ and VCM projects.

The process of identifying and recording rights to land typically involves the stages of cadastral surveying and mapping, demarcation, adjudication, recording of rights, and certification or registration. The following paragraphs discuss some of the typical options used that may be relevant to REDD+ or VCM projects.

4.1 Demarcation of area boundaries

The CDM *Procedures to demonstrate the eligibility of lands for afforestation and reforestation project activities* require that project boundaries are adequately agreed upon, and recommends the use of aerial photography, satellite imagery, or land cover maps, or a written testimony based on a Participatory Rural Appraisal. External demarcation may not be necessary on a national REDD project, however for VCM projects external demarcation of the project boundary is necessary to protect against encroachment and in-migration. In countries where there is pressure from international concessionaries, the importance of clearly delineating the boundaries between state land and private lands is clear. This demarcation

should also be supported by the demarcation and inclusion of state land in a register. Demarcation may also be important between different project areas and interests in land, to identify proposed expansion of land use by landholders during the project. In some countries participatory and low-cost demarcation methodologies could potentially be used. However, as Childress (2010) noted these “would need to be accompanied by policy processes to clarify criteria, procedures, institutional competencies for resolving questions of new communities, extension of existing communities and demarcation of boundaries”.

4.2 Cadastral and participatory mapping

Cadastral mapping is an important step in identifying the different types of tenure and their geographical extent and allow participation and agreement on the extent of rights by all parties. Low cost land cadastral mapping processes have been utilized in several countries and typically involve the use of topographic plans, aerial photography or satellite imagery for cadastral mapping and adjudication, supported by field verification. For example, in Namibia good quality aerial photography was available for much of the country and was used for cadastral mapping supported by field verification (Kapitango and Meijs, 2010). Lemmen and Zevenbergen (2010) also report on the use of high resolution satellite imagery for adjudication in Ethiopia.

More participatory approaches are required on communal lands that allow a full understanding of the complex *de facto* rights to land and resources, and the historical and established processes for changing land tenure arrangements and for settling disputes. De Wit and Norfolk (2010) state that there are several different methods for securing community land rights, although the basic principles and methods are similar. We mentioned already the rural land tenure maps *Plans Fonciers Ruraux* (PFRs) in West Africa. For community or customary land adjudication is becoming increasingly participatory and consultative. Adjudication is most difficult where the rights over land are complex or overlapping. Following the development of rural land tenure maps *Plans Fonciers Ruraux* (PFRs) in West Africa the survey record was signed by the right holder and the neighbours and lead to a simplified record of rights over land that are agreed upon at the local level (Lavigne Delville, 2010). According to Lavigne Delville (2010) the limitations of PFRs have been that rights over natural resources and common lands were barely taken into account, there was an implicit assumption that one parcel corresponds to one “owner” (albeit customary or collective),

De Wit and Norfolk (2010) argue that the PFR process used in parts in West Africa has been refined and developed into a process they called the “*Mozambique methodology for community land delimitation*” (Mozambique methodology”). The process generally involves a six stage process – educating the local people, participatory rural appraisal (adjudication), participatory mapping (of rights), cross-referencing and confirming information (adjudication), validation of information with neighbours (adjudication), cadastral processing (cadastral mapping and certification) resulting in a Community Land Certificate. None of this work involves formal cadastral fieldwork although the cadastral processing may rely on GPS coordinates of key points to georeference the interests in land.

4.3 Mapping Social Tenures and Overlapping Rights

Most rights to land and other natural resources are not recorded in the formal land administration system and are based on social (*de facto*) tenures that cannot generally be easily described relative to a parcel. In many cases there are overlapping rights or claims to land and resources that are contested. Rights often overlap, and can even be disputed, but that this can be handled with 'GIS layer' approach. While the traditional cadastral maps assumes one full spatial partition of the area into cadastral parcels, different, overlapping interests can be recorded in different layers when using GIS. These can be interests intended to co-exist, but also conflicting claims. Provision is required for the resolution of disputes over land rights and boundaries. This process should be community-driven as much as possible so that the community fully accepts the decisions. In indigenous and customary communities it is also important that the process of adjudication be consistent with traditional practices and cultural norms where practical.

Augustinus (2010) argued that it has become clear that a gap exists between the manner in which conventional land administration systems recorded rights and the range of tenures that exist on customary areas and for pastoralists and this gap meant that current approaches could not deliver robust security of tenure and land information and administration systems at scale in developing countries. The Social Tenure Domain Model was developed in response to this perceived gap and aims to record rights to land wherever they are on the continuum of land rights (UN-HABITAT, 2008). The Social Tenure Domain Model (STDM) is a tool developed under the ISO Land Administration Domain Model that describes the relationship between land and people through recording all forms of land and resources rights. It is possible under the STDM to record *de jure* rights as well as *de facto* claims to land and other resources that need to be verified through adjudication (Zevenbergen and Haile, 2010). The STDM records *Parties* (persons, or groups of persons, that compose an identifiable single entity), *Land rights* (may be formal ownership, apartment right, usufruct, free hold, lease hold, or state land, or social tenure relationships), and *Spatial units* (areas of land or water where the rights and social tenure relationships apply) (FIG *et al*, 2010 and Lemmen *et al* 2010).

Another software system for recording complex rights is the Talking Titler which allows flexibility in the way data relating to people, land and evidentiary media (titles, survey plans, descriptive documents, oral testimonies, videos, photographs, etc) can be stored and related. The system also supports a mix of paper-based and digital documents. Talking Titler seeks to incorporate the most relevant evidence that can be acquired. The flexibility in the database design allows for bottom up, top down and open-ended evolutionary system design. The Talking Titler software is licensed as freeware, and it can be used to manage a range of land information applications which do not handle vast numbers of records. The data recorded can also be registered under the Land Administration Domain Model (Barry, 2006).

4.4 Certification

The certification or registration of recorded land and resources rights provides a higher level of tenure security. One option is to record the rights on a register and issue land titles or

deeds. The limitations in land titling schemes are well documented, especially in countries with poor governance. Experience has shown that in many countries in which land titling has occurred the real benefits have accrued with the cultural elite and the more powerful, without the anticipated benefits for the poor. Registration of land parcels often fail to record the *de facto* complexity of rights. Conventional land registration draws on a model of individual parcels and individualized tenure. In many situations, this is culturally inappropriate where land is held by family groups or lineage groups or where it may not be divided up into individual lots for cultural reasons, or there may be overriding community rights in a parcel which are superior to those of the land holder. Hatcher (2009) argued that “The general conclusion is that while titling or registration is often a needed legal step, true security is a product of several social, cultural and political forces”.

An alternative to registration is to provide certification of land tenure. The certification process is less onerous than registration and in the absence of land titles may provide the highest form of *de jure* evidence of rights to land and resources. For example, PFRs aim to record all individual and collective rights including rights to natural resources and secondary rights. For collective land an “administrator” (who manages the parcel in the name of the group) is identified and recorded. In Benin registered plots receive a “land certificate,” which can be sold or used as collateral but the state does not grant them authenticity. On request, land certificates can be transformed into Land Titles (Lavigne Delville, 2010). The certification of land use (rather than tenure) is also used in some countries. In the early 2000’s there was significant rural land privatization in Vietnam and China resulting in the issue of land use certificates and increased formal recognition of these land use rights. These provide usufruct rights that provide a level of protection to the land user against claims to the land by others, and can be used to verify claims to land. In the absence of other forms of tenure security they may be the most secure form of tenure.

In the Tigray region of Ethiopia a low-cost certification system was implemented over a large area that aimed to incrementally improve tenure security. The process involved the use of four standard forms to record parcel data, registration details, the title certificate, and for changes to tenure. Technical staff were trained to administer the system and to record parcel data in the field in consultation with land holders and other stakeholders. Land boundaries were demarcated where needed using local materials, and land certificates were issued to households (UN-HABITAT, 2008).

Many of the existing REDD+ and other PES projects occur on state or communal lands, and several innovative approaches have been used to record these rights. For example, the Namibia Community Land Administration System (NCLAS) consists of two parts - the Communal Deeds (Register) and the Communal Cadastre (Map) both of which use readily available proprietary software. The Register and Maps are linked by a Unique Parcel Identifier (UPI) system. Four different types of output are created out of the NCLAS - Certificates, Village maps, Registers, and Index Cards. Registers are printed to provide easy access to the paper based system by UPI and village. Another example involves “Community-Based Natural Resource Management (CBNRM) schemes that have devolved group-based property rights to community user groups – often Customary Land Secretariats (CLS).

However, there has been a tendency to designate resource access and user rights as exclusive to particular groups, whereas in practice, a variety of groups may have established legitimate claims to resources such as dry season pasture, seasonal wetlands or fishing beaches (UN-HABITAT, 2008).

5. CONCLUDING REMARKS

The literature and case studies illustrate the potential for land issues and disputes in REDD+ and VCM projects, and also demonstrate the need for effective and fair land administration. All interests in the land and resources such trees and carbon must be fully understood and documented at the appropriate scale. Effective solutions may require the development of more innovative ways of recording all the rights and restrictions concerning land and carbon stocks. Otherwise the most vulnerable might be marginalized or lose their rights to land or PES payments is high on PES projects.

The approach taken in the case study projects (to varying degrees) to record property rights was the use of some form of existing spatial information such as a land cover map, or an aerial photograph or satellite image, as a basis for involving the communities and individual land users to reach agreement on project areas and the extent of rights to land. For example, on the Sofala Community Carbon Project in Mozambique the approach used was participatory land use mapping where land use and rights to resources were mapped using GPS on a participatory walk. The most effective approaches included consultative and participatory approaches to project design and implementation. Reviews of earlier projects such as the Noel Kempff REDD project in Bolivia found that more effective consultation during the early stages of the project was warranted. Later projects seem to have heeded these lessons. It has been generally acknowledged that a full understanding of all rights to land and resources is needed, and where competing claims and conflict over land exists, these should be resolved wherever possible prior to this land being included in the project.

Ideally the spatial information used to discuss and record interests in land and project areas should be geo-referenced so that the data can be incorporated into GIS or other information systems. Advances in remote sensing technology and analysis software are likely to result in an increase its application to these projects. The use of remote sensing is becoming increasingly important in mapping land cover, and identifying different vegetation classes, and there are examples of near real-time monitoring of deforestation. Two of the case study projects presented earlier all used remote sensing imagery mapping land cover and use, and as Childress (2010) noted, the “acquisition, analysis, management and use of remotely sensed imagery will likely form an important part of the planning and management of REDD schemes”. Satellite imagery will also be an important resource in delineating rights and claims to land. However, at this stage there is some uncertainty of REDD reporting requirements and this implies the need for flexibility in the design of land information systems. Full national ownership of REDD monitoring systems along with international collaboration is likely to be an important consideration on REDD+ projects (FAO/UNDP/UNEP, 2008). This will require the development of a land and resource information system that is sustainable and capable of this function, and effective cooperation between government agencies.

The previous discussion has reinforced the importance of recording all *de jure* and *de facto* rights to land and resources on REDD+ and VCM projects (to determine the beneficiaries). Land administration systems are the most suitable mechanisms to do this and their implementation on REDD+ and VCM projects should draw on international experience. A range of options has been presented that may be suited to many different land tenure contexts along the continuum of property rights (UN-HABITAT, 2008). Questions to be resolved include who are legitimate representatives of a community, and who else has *de facto* or *de jure* interests in land and carbon stocks. There is also the question of who is entitled to undertake the climate change mitigation works and this may be a secondary right holder such as a renter. The factors that determine if a land administration process is equitable include whether the process is systematic or sporadic, costs for the landholder, and the extent to which the rights of all family members, secondary right-holders, vulnerable groups, and minority interests have their rights recognized and accounted for (Alden Wily, 2003). There is also a role for land administration in registering state land and demarcating its boundaries.

Lessons for land governance on REDD+ and VCM projects are that land administration solutions must be appropriate for their context and if *de jure* rights are not consistent with *de facto* rights then there is potential for conflict. Accurate and up-to-date records allow transparency and equity and so land administration systems must be sustainable. Participatory adjudication and demarcation supported by enforcement by government agencies provides protection for the *de facto* rights on land users. Effective and innovative systems have been developed for recording complex and overlapping rights to land and resources and these support the participatory processes and help to settle disputes. Decentralization is important for ensuring access to the process by the more vulnerable. Computerization can help improve effectiveness and transparency if the capacity exists in the land institutions, and improve the capability to deal with overlaps in property rights, and conflicting claims.

There are two major drivers for registration of property rights on PES projects. The first is that registration of property rights is necessary to recognize that rights to land exist, and that countries cannot neglect these rights. The second driver, on VCM projects, is that registration of rights is relevant for the transparent and equitable transaction of carbon emission rights. The carbon reporting process requires transparent transactions and standards and land administration must be able to accommodate this (van der Molen, 2009). It may be advisable to develop guidelines on the process for assessing rights to land and resources, how cadastral (index) maps are developed, and how the complexity of rights is recorded. If a standard process is developed it will increase transparency and may improve governance. There are lessons for REDD+ and VCM projects from the European Union LPIS involving the need for verification of rights to land from beneficiaries. Like REDD+ projects, there are benefits to be able to link the monitoring of land clearing (or land use), with tenure. The design of land administration systems should be based on standards to avoid the implementation of land administration systems that are inflexible and don't allow the inclusion of new types of tenure or other land-related restrictions or responsibilities.

Land administration is likely to be part of an integrated approach to the administration of REDD+ and VCM projects rather than a stand alone project. The implications are that this will cut across sectors and often involve more than one agency and line ministry. The SAD and SLAPR systems in Brazil, discussed earlier, provided an example of the benefits of effective coordination between land and natural resources agencies.

Many attempts globally to formally record customary and complex rights to land have been unsatisfactory. The authors argue that innovative land administration systems are the most appropriate system for recording this complexity should be an integral part of REDD+ and VCM project design. Appropriate procedures should be developed for adjudicating, demarcating, and recording property rights and these procedures should be integrated into the carbon reporting and project implementation guidelines. This will require effective cooperation between land and natural resource agencies.

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