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Developing a Carbon Payment Scheme on Certified Forest Concessions

Discussion paper

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ABBREVIATIONS

AAC	Annual Allowable Cut
AFOLU	Agriculture, Forestry and Land Use
ASEAN	Association of Southeast Asian Nations
ATO	African Timber Organization
C	Criterion
C&I	Criteria and Indicators
CC	Carbon Credit
CCBS	Community, Climate, and Biodiversity Standard
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
COP	Conference of Parties
DD	Deforestation and Forest Degradation
FAO	United Nations Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FMU	Forest Management Unit
FRA	Forest Resource Assessment
FSC	Forest Stewardship Council
I	Indicator
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITTO	International Tropical Timber Organization
LiDAR	Light Detection and Ranging
MCPFE	Ministerial Conference of Protection of Forests in Europe
MRV	Monitoring, Reporting and Verification
NGO	Non-governmental Organization
P&C	Principles and Criteria
PCI	Principles, Criteria and Indicators
PEFC	Programme for the Endorsement of Forest Certification Schemes
PEOLG	Pan-European Operational Level Guidelines
PES	Payments for Ecosystem Services
PFE	Permanent Forest Estate
PMG	Project management organization
RED	Reducing emissions from deforestation
REDD	Reducing Emissions from Deforestation and Forest Degradation
SFM	Sustainable Forest Management
U.S.	United States of America
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VER	Verified Emission Reduction

EXECUTIVE SUMMARY

Potential synergies in combined REDD/SFM scheme

Reducing Emissions from Deforestation and Degradation (REDD) has been singled out as a promising avenue of cutting the rate of carbon emissions, contributing to mitigate climate impacts, as well as providing additional revenues that can be allocated to reward sustainable forest management (SFM). The final form of REDD is under international debate, but the various methods for monitoring and baseline definition are developing rapidly. This provides a good opportunity to assess their potential harmonization with implementation and certification procedures applied in SFM. SFM is already an underlying assumption for any eligible measure to mitigate climate change.

The degree to which synergy between forest certification and REDD verification can be achieved will depend on a number of factors which will be defined when the REDD framework is established. These factors include the accounting framework under which the activity will be reported; the type of forestry activity that international agreements will account for carbon credits (avoided deforestation, avoided forest degradation, reforestation, and afforestation); the level of measurement in general; and the cost of implementation at the management unit level. It is, however, clear already at this stage, that the combination of REDD implementation with the monitoring and certification procedures required in SFM brings benefits that can strengthen both instruments.

Benefits for combining REDD and SFM verification:

- **Common general objective:** Both instruments address the maintenance of forest resources and their productive functions and aim to decrease forest degradation and deforestation.
- **Support from existing institutional structures:** SFM certification is based on established international procedures for standard setting, monitoring, and verification and relies on existing institutions developed to guarantee competent, credible and impartial third party auditing and certification procedures. REDD monitoring, reporting and verification (MRV) can draw from these processes at the national and especially at forest management unit (FMU) level.
- **Increased benefits and higher motivation to implement:** The motivation to proceed with SFM and REDD increases when forest managers have the possibility to gain benefits from both instruments by complying with the combined SFM/REDD requirements. An option is to allocate the REDD revenues to the implementation and monitoring of SFM.
- **Contributions to baseline definition**: Informed and reliable baseline definition on the carbon emissions under pre-project conditions requires a broad understanding of environmental and socio-economic pressures on a forest area and their consideration in the baseline. SFM requires a fairly holistic approach to forest management including monitoring of environmental and social aspects which help to define the baseline properly and anticipate any risks for leakage.
- **Evidence on SFM:** Parties obtain a reliable evidence that REDD activities comply with the objectives of SFM if REDD monitoring and verification is linked with SFM. If not linked to SFM certification, the REDD process needs to define the minimum requirements for SFM and their verification.
- **Increased legal compliance:** SFM certification requires compliance with legislation and prevention of any unauthorized activity in the certified area, this contributes to improved enforcement and government access to statutory or REDD related revenues.

There are, however, a number of challenges that need to be settled before a combined scheme can be operational.

Challenges combining REDD and SFM verification:

- **Different scope in forest monitoring**: SFM monitoring focuses often on dominant and commercial species or species important from the point of view of biodiversity whereas REDD is interested in all species sequestering carbon in the ecosystem. SFM schemes do not convert the inventory data into stored carbon whereas for REDD the appropriate conversion variables are required. REDD also requires information on soil carbon stocks which are not traditionally assessed in SFM.
- **Accuracy requirements in REDD monitoring may be demanding:** REDD requires accurate data on carbon stocks, and it will be challenging to design a monitoring and verification system meeting the accuracy and transparency requirements while still being technically and economically feasible.
- **Development of complementing REDD criteria/indicators requires an international process in line with standard setting procedures:** Methods to assess the forest resources will require harmonization of SFM and REDD data collection and introduction of specific criteria/indicators that focus on carbon stock assessment. Such criteria should be elaborated at the international level respecting the principle of broad stakeholder participation in standard setting as applied in the development of all voluntary standards.
- **Measures to address leakage need to be developed**: Leakage is not addressed, in general, in SFM certification, which focuses on the management of the certified area. In REDD projects the prevention of unanticipated loss of net carbon benefits is highly important and projects need to duly address this already in the planning stage. SFM certification can provide useful information agents influencing forest use, but as such the system does not require any control for potential leakage. A combined system should include criteria and indicators (C&I) that address the leakage risk.
- **The final form of REDD is not yet defined:** The form and status of REDD is still under international debate and it is not clear whether it will be a voluntary or a regulatory instrument. SFM certification, on the other hand, is a voluntary, private sector and market-driven instrument. If REDD activities are deemed mandatory, there could be additional complications in aligning this with voluntary certification.

The overall objectives of SFM and REDD are compatible: both approaches aspire to enhance forest resources and decrease forest degradation. Thus, the basis for incorporating criteria contributing to REDD monitoring into certain SFM standards is feasible. Despite the different focuses on the data requirements of these two instruments, the requirements of many elements of SFM often overlap with REDD and are thus frequently mutually supportive.

Technical gaps in SFM standards in view of REDD requirement can be dealt with by amending SFM C&I to include the elements relevant for REDD. Because REDD is not yet an established system, it is premature to specify the harmonization needs, but for smooth integration it is essential to link REDD MRV with the existing forest certification procedures. There are on-going discussions on this regard e.g., in the FSC Forest Carbon Working Group and within PEFC. REDD administration at international and national levels should also be viewed from the point of view of administration structures applied in voluntary forest certification in order to avoid administrative barriers for a combined scheme implementation.

Concession forestry provides a good testing ground for a combined REDD/SFM scheme. Prerequisites for successful testing include that the use rights in concession areas are defined and established and forestry related legislation is in place and enforced. Concession rules provide a tool to specify legal and other requirements the concessionaire must comply with. In

several countries the contract terms already require certified forest management. Concession forestry is mostly market oriented focusing on international markets which may pay higher prices for sustainably produced timber, and hence offset some of the costs of the scheme.

Testing the integration of SFM certification and REDD monitoring in concession forestry faces fewer problems if tested in concessions that already have experience with SFM certification and related monitoring procedures, and are fairly large in size. It is also important to focus on areas with long-term concession agreements, this would decrease the risk for leakage and provide long-term assurance on the maintenance of the carbon stock (permanence). Monitoring procedures need to be reliable, and any certificate or credit must be based on independent monitoring, which is a standard procedure in SFM certification.

1. INTRODUCTION

The international community has recently acknowledged that forests play a vital role in mitigating climate change when carbon stocks are maintained or increased through avoided deforestation and forest degradation (DD). Currently the carbon emissions from DD account for about 20% of global athropogenic emissions (Millicone et al. 2007). The ongoing DD has been of concern for decades but efficient incentives to save forests at a global scale have not emerged. The instruments developed for climate protection may introduce new incentives to also protect forest ecosystems. REDD has been singled out as a promising avenue of cutting the rate of carbon emissions, contributing to mitigate climate impacts, as well as providing additional revenues that can be allocated to reward SFM.

The interaction between forests and climate is based on complex biogeophysical feedbacks. These interactions can dampen or amplify anthropogenic climate change depending on ecosystem, type and scale of forest intervention and athmospheric changes (Bonan 2008). The Kyoto Protocol and the United Nation's Framework Convention on Climate Change (UNFCCC) recognize only anthropogenic measures to increase carbon stocks in forests and leaving forests intact has not been perceived as anthropogenic activity until the introduction of REDD. It is important to recognize that forest ecosystems, even climax forests, have a great potential in lowering the net carbon emissions at the global level, although the emission and sequestration rates vary considerably between ecosystems. If REDD becomes a valid instrument to produce credits for carbon markets, the economic revenues from forest protection can be significant enough to safeguard forests. According to Mollicone et al. (2007) the lack of reliable data limits the possibilities of developing countries to gain from a potential REDD mechanism, although they account for large majority of deforestation globally. Therefore there is a need to expend considerable effort in improving forest data collection and management systems in these countries.

The underlying assumption in instruments mitigating climate change is that they should not conflict with the objectives of SFM. Sustainable management of forests can be demonstrated e.g. through voluntary forest certification. Voluntary certification in general, and forest certification specifically, has already internationally established procedures for developing and managing a certification scheme as well as for its implementation and monitoring in practice. The interest to require certified forest management for forest projects eligible for carbon credit (CC) payments is increasing and the possibilities to partly integrate the two processes are under discussion (e.g., with the FSC and Programme for the Endorsement of Forest Certification Schemes – PEFC).

Voluntary forest certification and the emerging carbon markets are instruments that can both support government policies to promote SFM in public and private forestry and to strive for market benefits for responsibly produced forest products. The challenge lies in how to align the long-term experience of SFM implementation and certification with the emerging REDD opportunities that focus on maintaining and enhancing carbon stocks.

To align REDD and SFM it is important to understand the dynamics of carbon pools in a forest ecosystem and have adequate knowledge on the impacts of management interventions and the recovery rate of the forest ecosystem. A REDD mechanism needs also take into consideration the risks for unplanned carbon losses, e.g. due to fires, and include measures to mitigate these risks. In general, the total biomass in a forest ecosystem and subsequent carbon stocks depend on the management regime and other interventions in the forests (e.g. unplanned fires). The total carbon stock in a forest stand consists of several carbon pools above and below the ground. In harvesting operations, the carbon stock is decreased from all of these pools. Harvesting initially affects the above-ground carbon stock when timber is removed from the stand, but it eventually leads to the decomposing of the root biomass and the release of soil carbon.

However, any harvesting intervention lowers the carbon stock and sequestration rate, whether the forest ecosystem retains a positive net ecosystem productivity depends on the intensity of intervention and the ecosystem's potential to recover from it. SFM and carbon-sensitive planning aims to reduce the total amount of released carbon in forest harvesting and to address all carbon pools in forest.

SFM certification usually requires measures to comply with the sustainable harvesting levels and control unauthorized activities in forests. It also limits harvesting in areas with environmental or social values. The limitation of harvesting rate to the sustainable level and restrictions on timber removals from valuable sites explain partly the observations claiming that the carbon stock volume is higher in certified forest stands (Glenday 2006, Foster et al. 2008) (Box 1.1).

Box 1.1 Correlation of the level of timber resources and certified forest management

> Certification requires that managers be responsible for all activities in forests during the period of the validity of a certificate. Their responsibility is to eliminate all illegal forest use in the area during that time.
>
> Certification also requires that forests be harvested according to a plan, and only according to a sustainable harvesting level.
>
> Certified concessions are often located in forest areas with good commercial timber resources, because managers applying for a certificate aim at market benefits, often in international markets.
>
> These three factors account for in large part the assumption that timber resources and carbon stocks are higher in certified forests than in non-certified ones.

Although sustainable management of forests and forest certification tend to limit the immediate harvesting potential, in the long-term the amount of the total timber yield in a sustainably managed forest is likely to be even higher than that in a non-sustainably managed forest, as the former's timber resources and yield can be maintained or even increased over the operating period (Nebel et al. 2005).

Concession forestry, which is the dominant way to allocate forest harvesting rights in tropical countries with high forests and low-governance, provides a good testing ground to analyze the practical applicability of combining SFM and REDD based on sub-national and nested approaches. Risks for deforestation and degradation are also often high in these countries. Focusing on channelling REDD payments to concession holders will allow for early involvement of private actors and wide participation of other stakeholders (e.g., industry, communities, NGOs) in the REDD scheme. It will also leave room for national strategies on REDD to be built upon lessons generated from the ground, instead of the common top-down approach which often disregards local peculiarities. This paper has a general approach to concession forestry and does not differentiate concession forests managed by industrial companies or communities.

The aim of this paper is two-fold. First, it is to look into the challenges in integrating REDD and SFM certification into concession based forest tenure system or at a forest management unit (FMU) in general. Secondly, the paper aims at triggering a broader discussion among interested parties on the practical implementation options and benefits of integrating REDD MRV to the SFM management system. The paper:

(1) conceptualises some of the main REDD elements: such as addressing forest degradation, challenges in setting up a baseline, and monitoring aspects;

(2) summarises existing SFM certification approaches and the capability of these to address forest-degradation-related carbon emissions jointly with REDD mechanisms;
(3) discusses the benefits and challenges in developing and implementing a combined scheme integrating SFM certification and REDD mechanisms;
(4) proposes types of concessions that would be feasible for scheme testing

Annex 1 presents a preliminary proposal for a model for a combined REDD/SFM verification scheme.

2. KEY ELEMENTS AND CHALLENGES OF REDD

2.1 Scope

REDD has been intensively debated internationally for the past two years[1]. Under the UNFCCC Kyoto Protocol, the parties have been assessing the potential to integrate REDD activities into this international framework[2]. In addition, various countries have been trying to integrate REDD into national policies. The U.S.A., for instance, is currently assessing a bill to implement a cap-and-trade program for reducing greenhouse gas emissions (the *Kerry-Boxer* climate bill) within the context of which REDD would have a role.

The REDD+ mechanism aims at identifying incentives to prevent deforestation and degradation (DD) in developing countries. The mechanism will be an important step towards reducing emissions from land use change in these countries (Millicone et al. 2007). The mechanism is particularly suitable for implementation of activities in areas where historical rates of deforestation and degradation are low (Parkert et al. 2009). The general abbreviation of REDD is used in this paper for reduced emissions from avoided deforestation and degradation.

Despite the fact that the concept of REDD has garnered support, it is not yet clear how REDD will be incorporated into national policies and international agreements. While the current international framework for REDD is still under negotiation, some elements which have been receiving special attention may be highlighted, including:

1. Definitions of deforestation and degradation
2. Scale of implementation
3. Scope of implementation
4. Reference levels / Baselines
5. Monitoring
6. Financing Mechanism
7. Distribution Mechanism (benefit sharing, Payments for Ecosystem Services - PES)

Even though all these elements are extremely important and deserve proper consideration, this paper will focus primarily on the REDD elements relevant to integrating REDD into forest concessions, without discussing issues such as the optimal scale that REDD activities should follow (i.e. national level, sub-national level, or nested approach). The distribution and financing mechanisms for implementing REDD activities, and markets for REDD credits will also not be discussed.

Issues related to forest degradation are usually more relevant than deforestation to the REDD implementation within a forest concession. Compared to deforestation, the definition of forest degradation is more complex and depends highly on the context in which it is used. In this paper, the definition of degradation in the context of REDD monitoring is limited to the definition used in the Intergovernmental Panel on Climate Change (IPCC) Guidelines and is described as *"The overuse or poor management of forest that leads to long-term reduced biomass density (carbon stocks)"* (IPCC 2003). Among the various definitions referred to in the literature, this is the most suitable to REDD, since it refers exclusively to the stand biomass and is measurable in an unambiguous way. However, the definition lacks other aspects, e.g., biodiversity, protection functions (to soil and water), and species composition, which are relevant elements in SFM.

[1] Reducing emissions from deforestation (RED) was first proposed as a mechanism to protect tropical rainforests at the 11th Conference of the Parties (COP) in Montreal in 2005. At COP 13 in Bali, RED was expanded to REDD, highlighting the importance of forest degradation.

[2] In COP14 in Poznan REDD became 'REDD+, which recognizes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

Another important aspect of REDD is that the carbon sink credits are only temporarily issued, so they will expire at some point in the future. The current REDD projects being designed are planned for an average timeframe of about 30 years that could be renewed.

2.2 Defining baselines for forest degradation in concessions

The baseline definition is the most important stage of the REDD process, the REDD mechanism is based on the principle of measuring emission reductions against a defined reference level, or the baseline. A baseline indicates the carbon stock/emission rate in the case where no REDD-related activities take place. It sets the bottom line on forest resources/ sequestration rates that future forest management should improve in order to gain carbon credits (CC).

There are several different approaches to setting a baseline for REDD monitoring. The key issue regarding REDD monitoring and verification (MRV) is to find methods for the credible prediction of forest use when REDD activities are implemented, and to estimate in quantitative variables, how these alternative forest uses influence the development trends of forest carbon stocks in the country/area compared to the baseline. The baseline is needed to define a benchmark scenario, so that the future emission reductions can be rewarded when measured by a reliable and recognized method. When setting a baseline, two issues need to be considered: the scale and the reference period.

2.2.1 Scale

The determination of the baseline depends on the scale of the REDD project, because trends and causes of deforestation and degradation change as the size of the area changes (national, sub-national and regional levels). There is an international consensus that the baseline level should be defined at the national level. A national approach to REDD and significant coverage globally are needed to deal with the risk that deforestation and degradation activities are displaced rather than avoided (Millicone et al. 2007). However, interested parties also claim that lower scale baselines addressing a sub-national level should be allowed, for example, in developing countries to provide a possibility for bottom up approach and to complement the gaps in national carbon accounting mechanisms.

For national level REDD, the baseline definition is limited to the overall carbon stock and emission rates for a country whereas for sub-national REDD projects the baseline can be defined for a specific area. The scale has implications on data requirements for assessing the trends in forest resource development. For REDD projects, the baseline assessment should also include areas outside the focal areas in order to avoid the transfer of degrading activities outside the project area (leakage). Studies have also raised the option to estimate the baseline as the weighted average of national and local deforestation rates.

2.2.2 Reference period

There are different options to define the reference base used in the baseline. The following two alternatives to estimate the baseline trends in forest degradation and deforestation have been considered in the REDD.

a) Continuation of the historical trend

The most common method is to derive the baseline from the actual DD rates over a defined time period. This is done by comparing forest inventory and remote sensing data from two or more points in time, and by determining the baseline development trend from the data. This type of baseline, based on the historical trend, is described as the amount of carbon lost per year during the period measured. This approach is often the most feasible, although there are difficulties in adjusting the local historical trend to reflect the current underlying causes of deforestation/degradation, which increases the uncertainty of the estimated rates.

This approach has also been criticised on the grounds that it treats areas with different starting points as equal in view of eligibility for REDD programme participation (e.g. virgin forest, sustainably managed forest, or unsustainably managed forest). A REDD project or SFM can have significant increases in forest resources/sequestration rates in degraded forests whereas in intact or already sustainably managed forests the forest resource baseline may be high and future management activities maintain but do not necessarily increase forest resources or sequestration rates. Thus providing equal opportunity for economic benefits using historical data for both well managed or intact forests and for other markedly more deforested areas has been found to be problematic.

b) Estimates for future trends

The second alternative gives a prediction on the future forest degradation and deforestation rate based on prevailing indicators that correlate with depletion of forest resources. The indicators reflect the current and future causes for forest degradation/ deforestation. These underlying causes are in general well known, albeit the reliable quantification of the future loss is difficult.

In general, baseline definition requires information regarding local, national and even global factors influencing the natural conditions, demand for forest products and the socio-economic conditions in a given country or region. Regional modelling approaches hold potential for providing more accurate baselines, but they also have several limitations. In most cases, the availability of historical data to predict the future is not sufficient, and in any event would require an expert agreement on the model validation, which may be hard to reach (Santilli et al. 2005). In spite of these drawbacks, knowledge on the issue and inventory technologies are developing rapidly and certainly will be more complete in the near future.

2.3 Risks for leakage

REDD projects aim at changes in forest use that have a long-term positive impact on climate. In order to reach the climate benefits, it is important to prevent unanticipated loss of net carbon benefits as a result of project activities and not anticipated in the baseline (Aukland et al., 2002). Such losses are often caused by the transfer of the undesired forms of forest use to other areas. For this reason, leakage[3] is also referred to as a greenhouse gas externality (Moura Costa et al., 2000). Because leakage usually occurs outside of the project's immediate boundaries, it is also referred to as an 'off-site effect'. Especially conservation projects are susceptible to leakage because they tend to restrict the traditional activities on the project site. If no alternative livelihood option is provided to the agents of deforestation/forest degradation, it may lead to a direct displacement of activities to another location (Aukland et al., 2002).

[3] Following the Marrakesh Accords, leakage in a Clean Development Mechanism (CDM) project is defined as the net change of anthropogenic emissions by sources of greenhouse gases, which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity (UNFCCC 2003).

For the analysis of leakage, it is necessary to understand its different causes and sources and to take these into consideration in the baseline definition and project planning. If the main elements determining a baseline are properly identified and understood at the onset of a project, a large extent of the potential leakage may be prevented (Aukland et al., 2002). Socio- economic information about history and current trends in land use changes, demography, and livelihoods, for example, can be used to estimate the risks for deforestation and degradation of forests. A large portion of degradation activities are related to the socio-economic conditions of a given area.

As discussed in the previous section, the scale of a REDD project has implications on the risks for leakage: small projects have greater risks, whereas larger sub-national or national projects can develop more effective leakage management (UNFCCC 2003).

2.4 Methods used in measuring for forest degradation and carbon loss

Reliable monitoring of changes in carbon stocks and emissions over time is a core requirement for verifiable climate projects in order to have valid data for CC assessment. This sets challenging requirements for monitoring methods and for the quality of inventory data. REDD comprises measuring for avoided carbon losses in DD whereas other initiatives to define forestry related CCs are based on establishment of new forests in reforestation and afforestation projects.

Remote sensing is the most commonly proposed method to be used in large-scale forest inventories (national or large concessions), although in many countries with cheap manpower, field measurements turn out to be the most cost efficient monitoring methods. Remote sensing provides great possibilities for REDD MRV, but its implementation requires resources with high competence, and it often fails to produce accurate data for small concession areas.

The feasibility of remote sensing in assessing land use indicators, including those relevant to REDD, is described in Table 2.1.

Table 2.1 Feasibility of remote sensing in detecting various changes in land use

Detectable with coarse Remote sensing methods	Detectable with more demanding methods and accurate data	Detection with REMOTE SENSING highly limited
– **Deforestation** – **Forest Fragmentation** – **Recent slash and burn** – **Major Canopy fires** – **Major roads** – **General canopy closure**	– Selective logging – Forest surface fires – A range of edge effects – Old slash and burn – Unpaved secondary roads – Canopy closure	– Harvest of most non-timber forest products – Old selective logging – Narrow sub-canopy roads – Understory thinning and clear cutting – Species recognition – Invasion of exotic species

The accuracy of remote sensing methods required depends on the requirements the produced data must fulfil:

- Generally, deforestation-related easily detectable features can be identified on low-resolution satellite images with less (or even no) reference field data.
- The more detailed information is needed, the more resource- demanding methods, materials and larger reference data sets are needed.

It is important to note that the information on species' volumes needs to be converted to carbon stocks and emission/sequestration rates through conversion variables and various

secondary indicators. To be able to do this accurately, local models for the conversion need to be developed based on solid scientific knowledge.

The monitoring of deforestation and a rough classification of the level of degradation can be done with low-resolution satellite images, universal models and interpretation methods. These methods detect deforestation and severe degradation recording only major changes in land use and forest biomass. Deforestation and severe degradation are detected through changes in the canopy layer (e.g. the level of canopy closure) and reflectance levels. These methods can provide cost-efficient rough estimates of the forest volume, but are unable to provide accurate total standing volume and carbon stock estimates. The main application of these is in detecting changes in different land-use classes, and they are mostly feasible for larger areas, e.g. when monitoring for REDD on a countrywide basis.

However, forest degradation is often difficult to identify with rough monitoring methods based on canopy density or other biomass indicators. Forests are often degraded due to the removal of commercially valuable tree species, which change their species composition, yield patterns and commercial, biological and often also social value. The main issues in monitoring for degradation at the concession level in tropical forests are how to recognise species, gain adequate biomass estimates and detect changes therein with sufficient accuracy. Thus a number of forest uses with small-scale impacts on the forest structure (last column of Table 2.1) can be monitored only by field inventories or a combination of field and remote sensing inventory methods, especially in forest ecosystems that have multiple canopy layers. Remote sensing methods are continuously improving and becoming more cost-efficient. Light Detection and Ranging (LiDAR) sensors detect changes under the canopy layer which together with locally adjusted models and field data provide information on the changes in all canopy layers. The high costs and demanding interpretation processes limit the use of these sensors.

Remote sensing methods for monitoring degradation have been until recently either too coarse in scale or too resource demanding for large areas. On the other hand the methods based exclusively on field inventory and extensive sampling require accessibility, are costly, and often lack transparency and objectivity. Local conditions, availability of man-power and/or technical expertise should always be taken into consideration when selecting appropriate monitoring methods at the concession level. At the national or regional level remote sensing based methods are usually more cost efficient.

Despite the limiting factors, the use of remote sensing provides the opportunity for coarse monitoring, and is effective in detecting hot-spot areas that should then be verified in the field.

2.5 Monitoring accuracy and its implications

The formal systems for assessing forest carbon offsets according to Verified Emission Reduction (VER) standards are based on different levels of accuracy in carbon monitoring. For example, according to the interpretation of IPCC Guidelines (2006), REDD-projects could be established in theory at three alternative tier levels, depending on the accuracy of information available and used (Table 2.2).

Table 2.2 Levels of carbon monitoring accuracy

Tier	Requirement
Tier 1	IPCC default factors
Tier 2	Country Specific Data for Key Factors
Tier 3	Detailed national inventory on key carbon stocks, repeated measurements of carbon stocks through time, using modelling.

Tier 1 identifies the total area for each land category, but does not provide information on the conversion of land uses. It only provides "net" area changes (i.e. deforestation minus afforestation) (GOFC-GOLD 2008). The accuracy in Tier 1-level monitoring can most likely be reached with remote sensing technology, but it does not provide results applicable at a smaller area e.g. a concession area. Thus Tier 1 -level accuracy is not suitable for REDD verification at the concession level.

Tier 2 involves the tracking of conversions of different land uses, resulting in an explicit non-spatial land-use conversion matrix. At the concession level, spatially explicit land conversion information is needed but it does not provide adequate information on forest structure and on potential degradation. Thus Tier 2 level accuracy is not sufficient for REDD monitoring at the concession level either.

Tier 3 requires detailed inventory data at the national level which provides the basis also for regional or concession level inventories. Meeting the requirements of the Tier 3 requires for local growth and yield modelling as well as regular forest inventories and updated forest data bases. Data on stand volumes, growth and yield are important data inputs for establishing a forest carbon monitoring system that generates tradable forest carbon offsets.

Meeting the Tier 3 level is challenging. Countries aiming at that level should have advanced forest monitoring systems and reliable data bases in place. Carbon trading gives a motivation to develop the monitoring systems as it is possible that CCs assessed at the Tier 3-level of accuracy will have a higher value in trading compared to the credits assessed at a lower level of accuracy.

2.6 Linking REDD with other monitoring systems

2.6.1 National level

The Forest Resource Assessment (FRA) of FAO compiles a global dataset on forest resources, including growing stock, biomass and carbon stock based on country reports. The available data demonstrates that the quality and reliability of the data are highly variable and only 6% of the countries reporting time series were able to provide the data at the Tier 3 level, 22% at the level of Tier 2 and 38% only at the level of Tier 1. Thus it is still a challenging task to improve the estimates on forest carbon stock (Mollicone et al. 2007, Marklund & Schoene 2006). This is a challenge in designing a REDD and SFM compatible monitoring and verification system that fulfils the accuracy and transparency requirements, while still being economically feasible to meet the objectives of the scheme.

In the absence of reliable national level data on forest resources the significance of FMU/ concession level inventories is emphasized in the assessment of forest resources. National data on forest resources or volume/growth models developed from the data may be used in combination with concession/FMU level inventory data.

2.6.2 Concession level

The methods traditionally used for concession level inventories vary depending on forest ecosystem, range of commercial tree species and availability of inventory data. Concession agreements together with other regulations specify the inventory requirements in most countries.

In moist tropics the concession level inventories often cover only the commercial tree species, their volume, yield and regeneration potential. In dryer ecosystems or in forests in sub-tropical, temperate or boreal vegetation zones, the species richness is lower and inventory data can more easily be collected to cover a larger share of tree species and tree biomass.

A carbon monitoring system for REDD can be constructed with additions to existing concession-level inventories. The concession level inventories traditionally focus on timber production and most often include at least some of the elements required by SFM (Table 2.3).

REDD mechanisms count carbon stocks and forest inventories provide volume data. This implies that the inventory data on forest attributes need to be converted into estimates of national/concession level carbon stocks, which is done based on national models or default values recommended by the IPCC (Gibbs, et al. 2007). Carbon stock estimation in complex tropical forest ecosystems is more challenging than in boreal/temperate ecosystems, but the current data limitations need and can be overcome to allow accounting with adequate accuracy (Mollicone, et al. 2007).

Table 2.3 Objectives of forest inventories and implications to data requirements at the concession level

Objective of forest inventory	Scope	Data requirements
Timber production	Data on commercial tree species.	Volume, yield data on the listed species, no data on other species.
Sustainable forest management	– Data on currently used and potentially used tree species – Identified biodiversity indicators – Identified social indicators	– Volume, growth and yield data on a number of species, some species with low share or importance may be ignored – Data describing status and changes in biodiversity and in social indicators
REDD	Data on total volume and growth and yield of forest including all tree species[1)] and soil carbon	– Detailed inventory data on all species – Verified estimates on carbon stock and changes in soil carbon – Models to convert volume/ weight based data into carbon stock in stand and soil.

[1)] Shrub and ground vegetation are not included in REDD

3. FOREST CERTIFICATION SCHEMES AND FOREST CARBON STOCK ESTIMATION

3.1 Consideration of carbon stocks and sequestration in criteria for SFM

Several international organisations have developed global or regional criteria for SFM. The objective of these criteria is to define the content of environmentally, socially and economically SFM. Related to carbon stocks, the criteria usually require maintenance of forest resources and implementation of controlled harvesting and regeneration procedures. Very few criteria refer directly to the role of forests as a carbon pool or a carbon sink, or suggest measures to mitigate climate change.

The sets of criteria for SFM most often serve one or the other of the following purposes:

a) To provide guidance for data collection on different aspects and impacts of forest management in a country or region.
b) To define the management system or performance level requirements for SFM.

The criteria in Category a) define the scope of SFM by indicating the data needs, but they do not include any performance targets. Such sets of criteria are useful when collecting information from different countries and analysing the differences between the countries, or when establishing data series on the trends in forest use.

The criteria in Category b) establish practical requirements with qualitative or quantitative thresholds that are applicable at the national or FMU levels. Such criteria, whereby one is able to clearly conclude whether or not an activity conforms to a criterion, may be included in the reference standards used in forest management certification.

A forest management certificate issued under an internationally recognised forest certification framework (e.g. FSC or PEFC) provides evidence that environmental, social and long-term timber production aspects are taken into consideration in forest management in addition to the carbon sequestration or offset. Forest certification also provides evidence that the management is complying with the relevant legislation in the country.

The following section describes in brief the requirements which relate to forest carbon stock, carbon sequestration or emission rates in different sets of SFM C&I. Several other criteria, such as those dealing with protection and drainage of forest soils, may also have implications for carbon balance, although their original purpose may have been different, such as preserving biodiversity or protecting water sources.

3.2 Existing sets of C&I for SFM

3.2.1 Criteria guiding data collection on forest management

Table 3.1 International Tropical Timber Organization (ITTO) Revised C&I for the Sustainable Management of Tropical Forests (2005)

Category A (see section 2.1)

Carbon stock related criteria Status quo	Carbon balance related criteria Dynamics
4.4 Total amount of **carbon stored in forest stands**	4.2 Actual and **sustainable harvest** of wood and non-wood forest products

Table 3.2 C&I for Monitoring, Assessment and Reporting for SFM in ASEAN countries (2007)

Category A (see section 3.1)

Carbon stock related criteria Status quo	Carbon balance related criteria Dynamics
4.4 Total amount of **carbon stored** in forest stands in the Permanent Forest Estate (PFE) and non-PFE for: (a) **above-ground** (forest vegetation) carbon stock; and (b) **soil** carbon stock. Describe the methods of measurement. Express in thousands of tonnes of elemental carbon.	4.2 Actual and **sustainable harvest** of wood and non-wood forest products, including total number of species harvested, in the PFE and non-PFE for: (a) industrial roundwood; (b) fuelwood; and (c) non-wood forest products

The ITTO C&I do not directly require the monitoring of carbon stocks, emissions or sequestration in forests. Rough estimates for carbon stock may be drawn from the data on forest resources and harvesting levels. The Association of Southeast Asian Nations (ASEAN) C&I, which are the regional adaptation of ITTO C&I in Asia, set ambitious monitoring requirements for carbon stocks above- and below ground. The availability of reliable methods and resources for monitoring may, however, prevent the practical implementation of the indicator.

The African Timber Organisation (ATO)-ITTO Principles, Criteria and Indicators (PCI) are regional level adaptations of ITTO C&I in Central and West Africa. They are developed to guide national level monitoring, but they also set very practical requirements at the level of a FMU. The FMU level requirements are in large part suitable for certification purposes, and they establish the baseline for national standards in the region.

ATO-ITTO PCI include many FMU level requirements that support maintenance and renewal of productive forest resources. In view of forest resource protection and avoidance of forest degradation, such criteria are important to assure long-term positive development of forest resources.

Table 3.3 ATO-ITTO PCI for the Sustainable Management of African Natural Tropical Forests (2003)

Purpose Category A; Structure close to Category B (see 3.1)
N.B. C= criterion; I= indicator

Carbon stock related criteria Status quo	Carbon balance related criteria Dynamics
National policy level C 1.1 The State has clear objectives for the sustainable utilisation of the forest heritage and a realistic action programme for their achievement. I 1.1.2 In the signatory countries, the clauses of all international agreements relating to the sustainable development of forests, such as … the Convention on Biological Diversity, the UNFCCC, etc, are respected. I 1.1.13 National forest **policies take into account the potential value of the carbon storage functions** of forests.	**National policy level** C1.5 The forestry service/administration implements **effective measures to ensure the monitoring and evaluation of the implementation of its forestry policy in relation to production, the conservation of ecosystems, and social benefits**. I 1.5.1 The State has a reliable and adequate **system for updating forestry information** and action plans and for adjusting the available resources as required to implement the action plans. I 1.5.3 The forestry service/administration ensures that each forest concessionaire has a complete forest **management plan** and a **'concession agreement'**, which sets out the obligations of all parties. Both documents are formally **approved** by the relevant **authorities**.
FMU level C 2.2 The FMU is managed with well-defined and clearly established **objectives** compatible with SFM. I 2.2.3 The forest concessionaire has a complete and approved forest management document, which includes a forest management plan, a harvesting plan, a wildlife **management plan**, and other relevant documents, stating the FMU's objectives, which are compatible with SFM. I 2.2.4 **A concession agreement** is annexed to the forest management document which sets the operating modalities and the rights and obligations of the forest concessionaire and sub-contractors operating in the FMU.	**FMU level** C 2.3 The **sustainable production** of timber is ensured both in quantity and quality. I 2.3.2 The felling rotation and **yield are clearly determined and respected** in accordance with the principles of sustainable production. C 2.6 Forest management is revised periodically, or when necessary due to unforeseen circumstances. I 2.6.1 There is a continuous monitoring/ evaluation of the implementation of forest management. C 3.2 The impact of harvesting activities on the structure of the forest is minimised. I 3.2.2 The harvesting methods do not impair the original structure and diversity of the forest. C 3.4 The **natural regeneration** capacity of the forests is ensured. I 3.4.1 The conditions for natural regeneration are fulfilled and regeneration processes are maintained.

3.2.2 Forest certification frameworks

The Forest Stewardship Council (FSC) and the PEFC are international forest certification frameworks that endorse national standards and forest certification schemes. They have each established a reference basis that national standards must meet. So far, national standards

have not included carbon- related requirements that would exceed the provisions set in the FSC or PEFC reference bases. The situation will change in the future when carbon monitoring becomes a commonly recognised requirement and more information is available on how it should be addressed in practical forest management.

Table 3.4 Principles and Criteria of the Forest Stewardship Council (FSC P&C)

The following criteria are relevant to carbon balance monitoring.
N.B. C= criterion; I= indicator

Carbon stock related criteria Status quo	Carbon balance related criteria Dynamics
C 6.4 Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources. C 7.1 The **management plan** and supporting documents shall provide: a) Management objectives. b) A description of the **forest resources** to be managed… d) A rationale for rate of **annual harvest** and species selection. e) Provisions for monitoring of **forest growth and dynamics**. C 10.2 The design and layout of **plantations** should promote the protection, restoration and conservation of natural forests, and **not increase pressures** on natural forests. C 10.5 A proportion of the overall forest management area, appropriate to the scale of the plantation and to be determined in regional standards, shall be managed so as **to restore the site to a natural forest cover.**	C 5.6 The **rate of harvest** of forest products shall not exceed levels which can be permanently sustained. C 6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including: a) **Forest regeneration and succession**. C 6.10 Forest **conversion** to plantations or non-forest land uses shall not occur, except in a few listed circumstances C 8.2 Forest management should include the research and data collection needed to **monitor**, at a minimum, the following indicators: a) **Yield** of all forest products harvested. b) **Growth rates, regeneration and condition of the forest.**

The FSC P&C are in line with the other sets of criteria for SFM, focusing on the forest resources and harvesting rates, but the FSC P&C set additional requirements for the monitoring of growth and regeneration rates. This volume and growth data would provide information for carbon-related C&I.

Table 3.5 Pan-European Operational Level Guidelines (PEOLG serve as the PEFC reference base)

N.B. C= criterion

Carbon stock related criteria Status quo
C 1 Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles C 4 Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems.The operational level guidelines promote afforestation and reforestation with native species and local provenances.

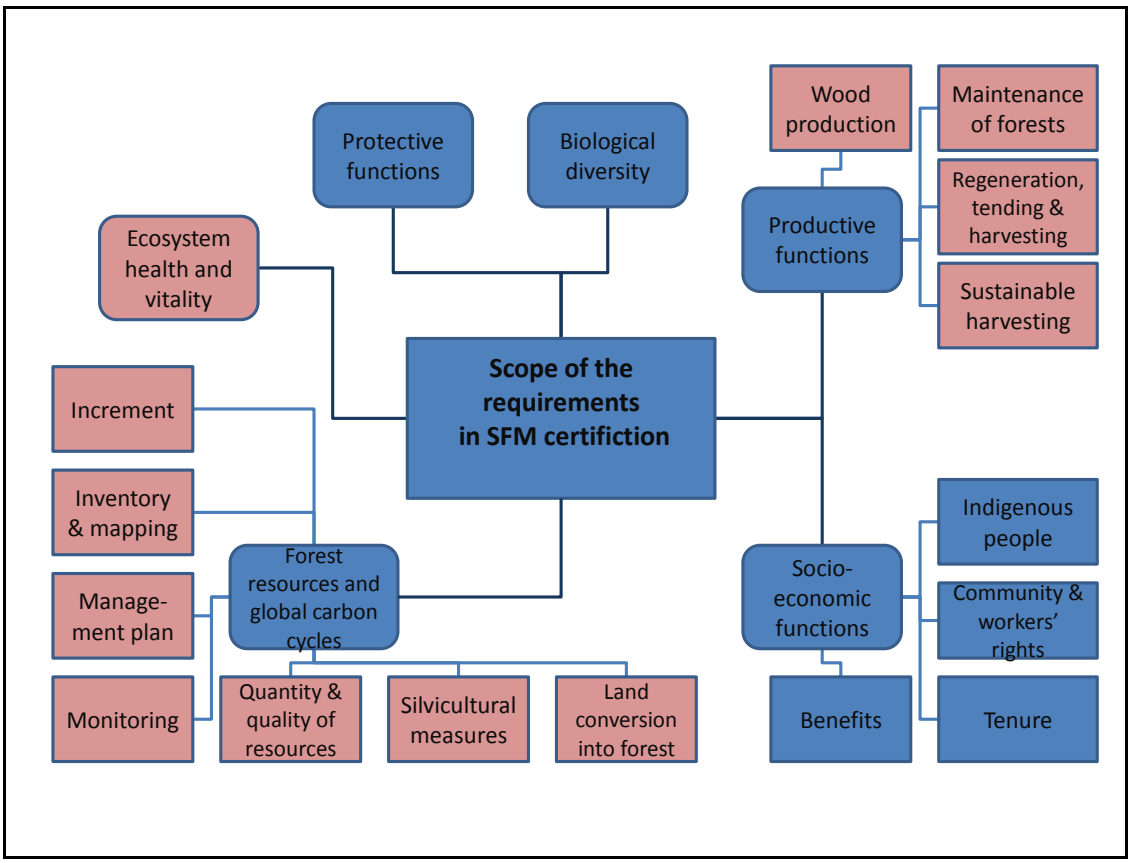
The PEOLG, approved by the Ministerial Conference of Protection of Forests in Europe (MCPFE), serve as the current PEFC baseline for the assessment of the national forest certification standard. These guidelines set requirements only on the maintenance of forest resources, while encouraging regeneration and afforestation. PEFC is currently reviewing its reference base for national standards and is considering the inclusion of carbon-related requirements that would be feasible to implement at the FMU level.

3.3 Conclusions on SFM certification in relation to carbon sink monitoring

In general, carbon sinks are not explicitly addressed in the international sets of criteria for SFM or forest certification standards, but several indicators indirectly address them. The current sets of C&I for SFM provide information on timber resources and harvesting levels but they need to be further developed with specific carbon-linked criteria and/or indicators in order to obtain adequate national- or sub-national-level information for carbon stock and sequestration monitoring.

The elements commonly covered in SFM certification are presented in Figure 3.1. Elements related to both SFM and REDD are coloured in red.

Figure 3.1 Elements covered in SFM certification



The SFM C&I have been developed with the purpose of supporting SFM; therefore, the approach differs from the one needed for combining SFM with REDD. SFM C&I do require implementation and monitoring of forest management measures which either enhance or reduce carbon sinks. Examples of measures which may increase carbon sequestration include reforestation, afforestation, fertilisation, and forest protection. Examples of measures that increase carbon emissions or decrease carbon stock include prescribed burning, pre-commercial thinnings, and removal of logging residues.

SFM C&I address the maintenance of forest resources and especially their productive functions, which are relevant also to REDD.

In addition to the SFM C&I used for reporting on forest management or forest certification, it is also necessary to take into consideration the area of influence of SFM certification compared to the various options in REDD. With SFM certification, forest management must conform to the C&I within the certified area. SFM certification does not include sufficient measures to prevent leakage, although most standards do address the conversion of forests to non-forest land or the conversion of bare land to forest land within the certified area.

4. SYNERGIES BETWEEN FOREST CERTIFICATION AND REDD

4.1 Basis of potential synergies

In general, sustainable management of forests is a precondition and baseline for any eligible measure to mitigate climate change. Some of the current carbon markets, such as the Chicago Climate Exchange (CCX), require forest certification as a prerequisite to receiving carbon payments (CCX 2008).

SFM certification can provide a consistent framework for REDD despite the differences in the approaches of the two initiatives. The most important area for synergy is that both SFM and REDD carbon verification require well established procedures of gathering information on the FMU. The level of synergy depends on how thoroughly the two instruments can be combined, i.e. what the selected approach is for REDD MRV; and how much additional input is required to expand the data retrieval in the initial inventory to cover the REDD requirements in scope and accuracy and approaches in baseline definition.

SFM standards cover a broad range of social, environmental and economic aspects that contribute to the long-term sustainable management of forest resources and carbon stocks. SFM certification requires solid management procedures from the applicant organisation that should give the assurance on the applicant's systematic conformance to the requirements. Such a management system approach is also essential in the monitoring and reporting of carbon stocks for REDD. However, it is quite evident that existing SFM standards need to be amended to meet the specific needs of monitoring for land-use changes and carbon stock volume fluctuations.

SFM certification has also the potential to address several other REDD-related, often hardly manageable, issues with a broader scope. The additional opportunities for synergies between SFM and REDD are presented in Table 4.1.

Table 4.1 Other possible fields of synergy

Area of synergy	Description
Risk management	SFM criteria address fire and other damage, and require prevention measures
Biodiversity / Environmental aspects	Biodiversity impacts that are of concern for carbon sink enhancement are incorporated in SFM criteria. If the scheme is developed with REDD(+), protective functions and biological diversity also need to be addressed in more detail.
Permanence	SFM certification relies on internationally approved institutional verification frameworks with appropriate methods for third-party quality control. SFM criteria include a broader range of requirements mitigating both leakage risks and adverse social or environmental impacts of REDD-related carbon monitoring
Transaction costs	Economies of scale can be achieved in cases where a combined verification scheme for REDD and SFM can be established. Group certification can lower the direct costs for an individual forest manager, holding the potential for providing smallholders with easier access to carbon markets.
Capacity building	The need for building knowledge and capacity is recognised for both procedures. This may produce synergy if the work can be organised jointly.
Organisational structure	Existing SFM certification schemes may reduce the need for building organisational structures for REDD.

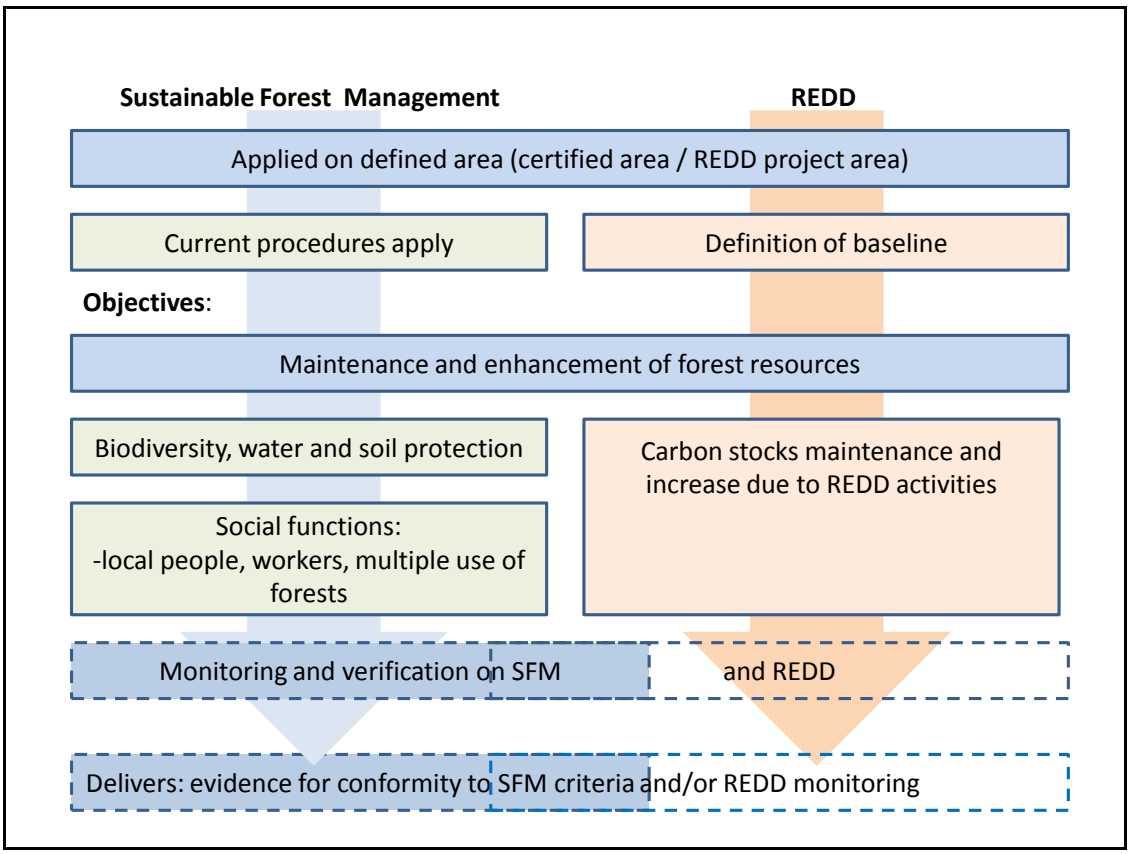
Area of synergy	Description
Financial support and incentives	Carbon sink credit returns may prove to be an additional means of income for the private sector when implementing SFM certification schemes. Or, SFM certification may give added value and marketing advantages for CCs.
Social aspects	Concession forestry has been criticised for its negative impacts on the local people and society. SFM certification addresses social aspects widely, and may assist in reducing these negative effects.

Leakage management requires special consideration because it is not adequately addressed in SFM certification. SFM certification often reduces harvest levels in an area or requires more expensive harvesting measures (e.g. worker training and safety measure), which may result in the transfer of some logging operations to areas outside the concession. C&I that specifically address the risks for leakage should be included in the standards.

4.2 Combining SFM standards with REDD monitoring requirements

The overall objectives of SFM and REDD are compatible: both approaches share as a goal the enhancement of forest resources and the decrease in forest degradation. The specific objectives have somewhat different focus: REDD focus on carbon stocks and their fluctuation and SFM on a broader concept of environmental, social and economic sustainability. Development of a forest management and monitoring framework that encompass both REDD and SFM monitoring is achievable but requires harmonisation between the forest management standards for SFM and REDD requirements. Figure 4.1 describes both the common and specific elements of SFM monitoring and REDD.

Figure 4.1 Common and specific elements of SFM and REDD monitoring



Among the SFM certification schemes, both PEFC and FSC schemes include requirements for the recording of forest stocks, but the emphasis is on stand volume, species distribution, biodiversity and other conventional forest inventory data. This data may be used for biomass and/or carbon estimation through the utilisation of biomass/carbon models such as biomass expansion factors and default biomass values provided by the IPCC. However, the use of these models achieves only limited monitoring accuracy with respect to carbon stocks, and may limit the type of market that the forest offsets are able to be verified under.

Concerning REDD, the focus of the monitoring is on the estimation of total tree biomass (above and below ground) and on the changes in both biomass and soil organic carbon. Therefore, REDD monitoring and data collection should include all forest species, regardless of their economic value or size. In addition, recording growth, harvesting (legal and illegal) and other changes in the forest stock (such as natural mortality and fires) is necessary in order to assess the changes in carbon stock. In current inventories, especially in tropical countries with a large variety of tree species, forest data is often collected only on the marketable species, and thus it does not provide adequate information on forest carbon stocks for REDD monitoring.

Complete integration of SFM and REDD monitoring would require the development of specific carbon C&I. These would determine the requirements for national, FMU, or concession level inventory data collection and monitoring of forest resources. Also the scope of forest management planning procedures would need to extend beyond conventional SFM planning (e.g. carbon sensitive planning).

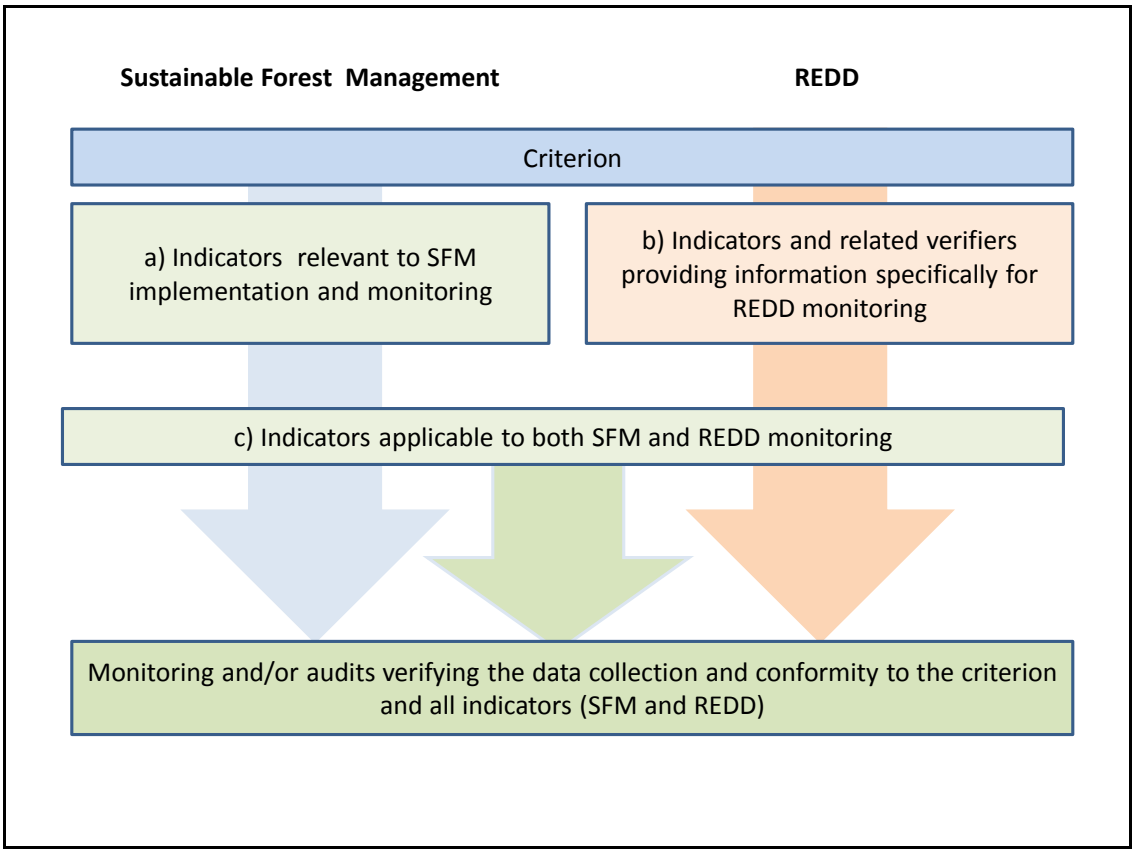
The standards used in certification under the FSC and PEFC schemes support the maintenance of productive forest biomass, so there are excellent grounds for including REDD requirements and monitoring into the SFM standard requirements. The task requires good cooperation between the research and forestry sectors as well as with other stakeholders. The existing standards for SFM have been developed following a similar multi-stakeholder process as used in UNFCCC, for example.

4.3 C&I for combined SFM-Certification and REDD

The interface between SFM certification standards and REDD is broad, with shared interests in multiple areas and functions (see Figure 3.1). Both approaches set compatible requirements for the area of application (forest area), enhancement of forest resources and the monitoring of these. Monitored variables differ somewhat in the details, but the data can be collected using the same assessment procedures. REDD monitoring requires exact quantitative data on forest resources which can then be converted to carbon equivalents, whereas SFM monitoring also recognises qualitative data that provides evidence for a consistent implementation of SFM criteria. SFM monitoring provides requirements and procedures to verify conformity to the underlying SFM requirements of REDD projects, e.g. protection of biodiversity, legal compliance, and respect for social rights.

Assessment of the forest stand characteristics for SFM and REDD can take place under the same monitoring/auditing process if the C&I relevant to REDD are integrated into one standard that provides the compliance with both SFM and REDD when implemented in practice. Such combined standard may include separate REDD specific criteria or existing SFM criteria may be amended to include indicators the measure aspects relevant to REDD. Figure 4.2 illustrates a possible structure of one criterion that delivers information on compliance to SFM and REDD through SFM and REDD specific (a and b) and combined (c) indicators.

Figure 4.2 Illustration of a possible structure for combined criteria and indicator for SFM and REDD



The following sections discuss the various issues to be considered when modifying SFM C&I to also include the data collection needs for REDD monitoring and provide examples of possible approaches to SFM standard modification.

4.3.1 Assessment of stand characteristics

Standing stock can be assessed using the same measuring methods regardless of whether the objective is SFM or REDD monitoring. The methods are based on field inventories or remote sensing or in the most cases on the combination of the two methods. Measurement of below ground carbon pools for REDD require adoption of measurement/ modelling methods not traditionally included in inventories for SFM.

Measurements needed for SFM aim at assessing the proportion of the stock that is related to the sustainable use of forests, which translates mainly into species with commercial value or importance for biodiversity. In SFM inventories the interest is in volumes, stem numbers, and age- and size- class distributions, the aim being to secure sustainable harvesting rates and carry out silvicultural operations. The scope for REDD is more specific: the data on carbon stocks must include all carbon in all tree species, including the total standing stock and the carbon pools in debris and soil.

Table 4.2 describes the current SFM criteria on stand characteristics and their monitoring and relates them to REDD priorities. The table also presents a preliminary proposal for a combined SFM and REDD criteria.

Table 4.2 Example of modification needs of C&I addressing stand characteristics

SFM Criteria	SFM Indicators/ verifiers	REDD Priority	C&I Proposal in view of REDD
FSC C7.1 The **management plan** and supporting documents shall provide: b) Description of the **forest resources** to be managed… .	– Stand volume of – Commercial species; or – All species – Age class distribution – Diameter distribution by focused species – Regeneration potential	– Volume of total wood biomass (all species) – In future reserves in below-ground carbon pools (roots and soil)	Description of the **total volume of forest trees by species or species groups**. – In the future: estimates for stump and root volumes, their carbon stores and dynamics[1]. – In the future: age/class distribution, diameter distribution, regeneration potential by species or species groups. – Desired quality variables
PEOLG C3 Maintenance and encouragement of productive functions of forests (wood and non-wood) Improvement of the quality of forest resources (3.2a)	– Medium height – Share of commercial species – Genetic quality of commercial species		

[1] A great share of root biomass, especially fine roots, decay within a short time after harvest, therefore a dynamic approach is needed for root carbon estimation

Once the differences in the scope of inventory have been adjusted for, the requirements of the inventory and data collection processes are similar for both REDD and SFM. The level of detail addressed is case-specific and has to be considered carefully when the indicators are being developed.

4.3.2 Growth

The growth of forest stock is measured and estimated with the same methods regardless whether the purpose for the estimation is SFM and allowable harvesting levels or REDD and increase in carbon stocks. Table 4.3 describes potential SFM and REDD compatible C&I for growth and yield estimation.

Table 4.3 Example of modification needs of C&I addressing growth and yield estimations

SFM Criteria	SFM Indicators/ verifiers	REDD priority	C&I Proposal in view of REDD
FSC C8.2 …data collection needed to **monitor**, at a minimum, the following indicators: a) **Yield** of all forest products harvested. b) **Growth rates, regeneration and condition of the forest.** C 5.6 The **rate of harvest** of forest products shall not exceed levels which can be permanently sustained.	– Pre and postharvest inventories – Growth rate (m^3/a) by species or species groups – Harvested volumes by species (documents on removals) – Estimates of the volumes of damaged trees in harvesting – Estimates for annual allowable harvesting levels for long-term sustainable production – Silvicultural measures required to maintain the desired growth rate by species or species groups (regeneration measures, intermediate harvesting)	– Data on the total volume growth – Conversion of the increased volume to carbon equivalents – Data on removed volumes through harvesting or natural drainage	– Growth rate (m^3/a) by species or species groups – Harvested volumes by species (documents on removals) – Estimates of the volumes of damaged trees in harvesting and natural drainage – Estimates for annual allowable harvesting levels for long-term sustainable production – Silvicultural measures – Data collected in pre and postharvest inventories and in harvesting documents
PEOLG Management to safeguard the quantity and quality of the resource (1.2a) Silvicultural measures to be taken to maintain the growing stock (1.2b) Harvesting level not to exceed sustained rate (3.2c) and not to cause lasting damage to ecosystems (4.2e)			

4.3.3 Annual allowable cut and rotation time

SFM sets requirements for maintaining the vitality of forest stands and biodiversity (e.g. FSC C5.6: “The rate of harvest of forest products shall not exceed levels which can be permanently sustained”). The annual allowable cut (AAC) is calculated according to this principle. The approach in REDD aims at the maintenance and increase in the amount of captured carbon. The role of species that have low- or no commercial value, but contribute as carbon pools, is also emphasised.

Rotation time can be considered to be a tool as well as a restriction in the formulation of an AAC and management plan. Similarly to other criteria, once the framework is adjusted, the setting of the rotation time is then done in same way to meet both SFM and REDD purposes.

4.3.4 Illegal logging

For both SFM and REDD, the management of illegal and unauthorised harvests is essential. In SFM, the focus is on measures to reduce illegal activities and to monitor operations taking place. As for REDD, it is essential to have information on the total carbon stock balance (Table 4.4). Therefore, the criteria need to be extended to cover measures to estimate the

loss of carbon due to these unplanned operations. Illegal logging and the monitoring thereof are also closely related to fire protection and forest clearance.

Table 4.4 Example of modification needs of C&I addressing illegal logging

SFM Criteria	SFM Indicators/ verifiers	REDD priority	C&I Proposal in view of REDD
FSC C 1.5 Forest management areas should be protected from illegal harvesting, settlement and other unauthorised activities.	– Marking and surveillance of boundaries – Monitoring for evidence of illegal or unauthorised activities – Maintaining of a record of all detected instances and of any subsequent actions taken – Co-operation with local communities – Same indicators as in FSC but in less detail	– Detect all harvesting operations (authorised and unauthorised) – Estimation of carbon loss in all harvesting operations – Real-time carbon stock database	Measures to avoid unauthorised harvesting and appropriate methods to estimate the total removal. – Exploit information from existing SFM indicators – Remote sensing methods for detecting areas logged illegally or against management plan – Field verification in detected logging areas
PEFC Requires compliance with national legislation			

4.3.5 Management plan

A management plan is required for both SFM certification and REDD monitoring. Management plans, especially when binding, translate the SFM and/or REDD requirements into practical operations and provide an informed estimate of the development trend in forest resources.

In general, the management plan is described and addressed well in SFM standard criteria. The content of a management plan can be amended to include the REDD-specific information and management commitments. The focus in management planning for REDD should emphasise carbon-sensitive land-use planning, taking into account all the factors related to carbon balance in the project area as well as its possible influence on the surrounding areas (leakage).

5. CONCLUSIONS ON LINKING TOGETHER FOREST CERTIFICATION, CONCESSION MANAGEMENT AND REDD

During the past decade, SFM certification has proved its efficacy for improving social, environmental and economic aspects of forest management. Indeed, SFM certification has contributed greatly to the long-term sustainable management of forest resources. SFM certification has also proved its positive impact on improving forest management in countries where governance capacities are insufficient to adequately manage natural resources and to enforce pertinent regulations. Most certification systems require that the activities being certified comply with national regulations and address measures in the enforcement of the legislation. In countries with insufficient resources for law enforcement, governments rely partly on certification in their monitoring for compliance with national regulations in forest operations on public lands.

REDD has been intensively debated internationally for the past two years, but its final form remains to be decided. The implementation of a REDD scheme has some special characteristics and challenges when applied to forest concessions. The definition of the reference level (baseline) on the small-scale sub-national level is complex and requires further modifications, as compared to the definition procedures for larger areas. Leakage management becomes an important issue when the project scale is small, and will require careful consideration during the development of an operational scheme. The methodological procedures related to REDD monitoring as well as REDD baseline definitions are developing rapidly which contributes to their potential harmonization with SFM certification.

Existing SFM criteria provide a solid basis for environmentally, socially and economically SFM whereas REDD focuses on extensive and reliable monitoring, verification and reporting of changes in carbon stocks and emissions over time. Despite the different focuses in the data requirements of these two instruments, the requirements of many elements of SFM overlap with REDD and are thus frequently mutually inclusive. The only major difference between the SFM criteria for measuring forest resources and the criteria for REDD monitoring is that the REDD mechanism covers all carbon pools and sources of carbon, whereas SFM criteria focus solely on timber (and in the tropics, often only on commercial species). As this is in reality a distinction that is handily dealt with by revising SFM C&I, an international effort should be made to integrate the required REDD monitoring indicators and other related baseline requirements into the SFM standards, which may in turn then be applied in FMU/concession level certification.

By combining these two approaches to assess the impacts of forest use, economies of scale can be taken advantage of and resources saved through

- Harmonisation of criteria/indicators for forest management to include information relevant for REDD and SFM
- Combined forest inventory/ data collection for REDD and SFM in view of the harmonized criteria/indicators
- Auditing of REDD and SFM compliance in same audits based on harmonized criteria/indicators.

Integration of REDD and SFM requirements into practical forest management planning, implementation and monitoring at the FMU/concession level along with the joint auditing reduces the resources needed specifically for REDD. Such integration also motivates managers to comply with the requirements.

The combination of SFM with REDD thus has several advantages. However, the amount of harmonisation between the two instruments is dependent on the type of the final REDD scheme.

It is important to understand that in the context of SFM certification, all C&I are developed in a participatory stakeholder process during which academia, non-governmental organizations (NGOs), governmental authorities and forestry sector operators can share their knowledge and submit their views for decision making. The standard setting procedures are well established in different forms of voluntary certification and described in general in the documentation of International Organization for Standardization (ISO). Within forest certification, both FSC and PEFC have detailed regulations for the stages in standard setting and for the measures to encourage stakeholder participation in the process. In order to respect the participatory approach in standard setting and to assure that the outcome is applicable in different conditions and acceptable to the interested parties, the modification of REDD related verification requirements into SFM standards should also be done through an international stakeholder process.

The process may define REDD specific C&I that measure the conformity to the criterion in general and amend the general set with complementing indicators for tropical, temperate and boreal ecosystems, if necessary. The standard setting should be based on the sound knowledge on the carbon dynamics in these ecosystems. International forest certification frameworks (PEFC and FSC) have also general requirements for standard[4] that define the minimum performance requirements any standard endorsed by these frameworks must meet.

When considering ways of integrating forest certification into concession rules, an important aspect to take into account is the nature of forest certification and REDD. Forest certification is essentially a voluntary, private sector, market-driven instrument, but the international community has not yet decided how to classify REDD, as to date there is no agreed-upon framework. If REDD activities are deemed to be mandatory, there could be extra complications in trying to align this tool with forest certification.

[4] Note PEFC has different reference basis for tropical and temperate/boreal standards.

6. NEXT STEPS IN DEVELOPING THE SCHEME

An integrated scheme of REDD and SFM certification has potential in promoting SFM in high-forest/low-governance countries. Voluntary forest certification and the emerging carbon markets are instruments that can both support government initiatives to implement SFM through concession rules and communicate the resulting achievements to markets. However, there are several issues that need to be solved before the scheme can be implemented on a large-scale. In addition, high variation in the circumstances between regions and countries makes it difficult to establish one universal scheme with detailed instructions.

In this paper we have discussed the possibilities and limiting factors of developing a carbon payment scheme on certified forest concessions on a general level. The next step in developing the scheme would be to select one country or a set of countries to assess the feasibility in more detail, taking into account the local conditions.

At the country level the issues outlined in Table 6.1 should be taken into consideration when establishing a scheme for REDD payments in integration with SFM certification. Forest administration, legislation and institutional capacity for monitoring and enforcement along with the availability of up to date data on forest resources and trends in their development define the possibilities of government involvement in the scheme implementation. REDD payment schemes aim at long-term stable incentive and control systems, which require favourable institutional and governance conditions (Millicone et al. 2007).

Table 6.1 National level aspects to take into consideration in pilot testing

Factor	Description
Forest cover	– Availability of information on forest resources – Main uses of forest resources – Rates of degradation and deforestation
Forest administration	– Institutional capacity on forestry sector, specifically in enforcement and monitoring – Capacity for SFM forest management planning; flexibility to adapt plans in view of SFM and REDD – Institutional capacity to contribute for national level REDD scheme administration – Capacity to prevent the forest damages decreasing forest carbon pools (e.g. fire control) – Interest for participating in pilot testing and allocation of resources – Capacity to develop and maintain a REDD scheme (technical incl. remote sensing and institutional)
Society	– Government's and interested parties' support to SFM certification/REDD, benefits, responsibilities – Procedures for land use planning, compliance level – Political stability – Level of environmental and social legislation – Level of legal compliance
Rate of deforestation and degradation (DD)	– Rate of DD at national, regional and concession area level – Risks and reasons of DD, their correlation with SFM elements
SFM	– Interest in SFM certification for forest concessions – Existence of regional/national standards – Availability of accredited, competent certification bodies and auditing services (international or national)

Factor	Description
REDD capacity	– Capacity to forest carbon assessment (stand and soil) – Availability of data to establish trends in forest resource development – Verification capacity (see also SFM certification) – Reporting capacity

Table 6.2 lists the main aspects that have implications to the implementation of the potential combined REDD/SFM at the concession level forest management.

Table 6.2 Concession Level Aspects to Take into Consideration in Pilot Testing

Factor	Description
Forest management objectives	– Rules and agreements for concession forestry; level of compliance – Awareness on SFM and carbon stock management – Interest in SFM certification / REDD and availability of resources – Benefits gained through SFM/REDD certification/verification
Aspects relevant to SFM and REDD	– Compliance level to SFM requirements – Current SFM monitoring systems, their synergies with REDD – Interest in SFM certification, available resources – Availability of data on forest carbon pools and trends in their development

The paper concludes that implementation of a potential combined REDD/SFM scheme, at least in its early stage, is most feasible in larger scale concession areas, with a long-term concession agreements. The combined implementation of SFM certification and REDD payments can provide an economic incentive to strive for sustainable and climate protective forest management, if the benefits are allocated as appropriate to concession holder and other sectors in the society. In low-governance countries, concession agreements, rules and voluntary certification provide measures to strengthen the transparency and control over forest management. Table 6.3 summarizes the benefits and disadvantages related to the types of concessions and their management rules in view of combined scheme identified in this paper.

Table 6.3 Aspects related to concession rules to be taken into consideration in Implementing REDD through SFM certification approach

Method	Pros	Cons
Lengthening of concession contracts	More secure concession tenures provide incentives for SFM.	Without fear of losing contracts, there is no obligation to improve Forest management.
Cancellation rules	Performance-based renewal conditions provide a powerful incentive for reduced-impact logging and SFM.	Reduces long-term tenure security.
Enlarging of concession sizes	Provides economies of scale, and the sustainability of timber flow from harvests.	If forest fees and revenues are low, this may lead to inefficient forest management and untapped harvesting capacities.
Forest fees and revenues	Financial incentives for certified operators.	Low fees can provide disincentives, over-expansion, wastage of valuable timber, over-cutting and depletion of forest resources.
Adjusting direct management rules to be closer to standard requirements	The closer the rules are to the standard requirements, the less additional resources are needed for a concessionaire to apply for forest certification. SFM standards cover a broad range of factors affecting forest management's sustainability of forest management, and therefore can be used as guidelines in improving the concession rules.	Stricter requirements may restrict the number of concessionaires and may lead to a decrease in harvesting levels and thus also forest revenues. For the most part, the government's capability of monitoring forestry activities is insufficient in high-forest/low-governance countries. If the supervising cannot be improved, any adjustment does not have much impact. In some countries, NGOs have been able to assist governments with this.

The types of forest concessions vary considerably from country to country. Industrial concessions are common, e.g., in Central African countries with moist tropical forests with high timber volumes and growth potential. There individual companies, often operating in export trade, have the harvesting right over a designated forest area. Concession agreement may include responsibilities related to regeneration of valuable trees and allocation of resources to neighbouring communities. In general companies stay in the area for the concession period of ten to 15 years and turn the tenure right back to government when the harvesting rights are used.

Latin American countries have wide experience on concession areas given to communities. In this case the forest use includes timber but often also other forest products. The communities are bound to the area and therefore their interest is to have long-term contracts and sustainable production from the area. Communities often trade timber in domestic markets where the pressure for forest certification is not high, compared to the international markets.

It would be important to test the combined REDD/SFM scheme in both types of concessions, and adapt the scheme to meet the needs of the different conditions.

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DEVISING A TECHNICAL SCHEME

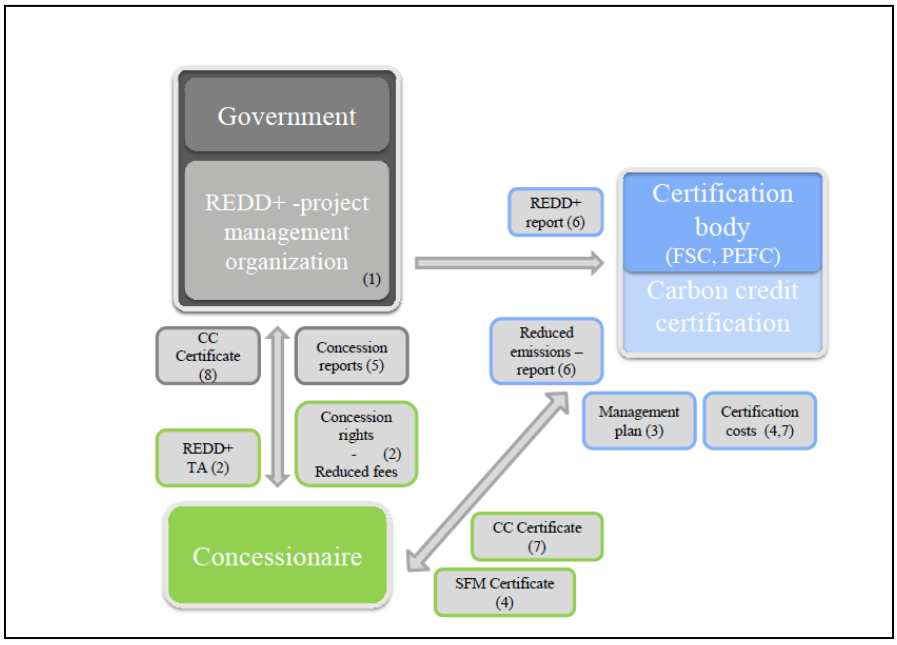
1. DEVISING A TECHNICAL SCHEME

In order to implement the ideas presented in this study for linking forest certification standards, the REDD mechanism, and forest concessions, a potential technical scheme that can be implemented in a pilot Forest Carbon Partnership Facility (FCPF) case will be described. The description includes the relevant stakeholders who should be involved in the process, the flow of activities, a potential monitoring system, and a list of potential benefits and avoided costs. As there are a number of controversial issues related to describing and implementing this scheme, some key questions that have been raised while producing this report are presented in section 1.3.

1.1 Scheme Description

The following diagram presents a technical scheme that integrates sustainable forest certification and REDD+ for concession management (Figure 1.1).

Figure1.1 Scheme for Integrating REDD+ and Voluntary SFM Certification



1.1.1 Stakeholders

a) **Government**

The government in the scheme will be one of the 37 FCPF country participants.

b) **REDD+ -project management organisation**

The scheme is based on a REDD+ project management organisation (PMG) consisting of a steering committee and a group of technical advisors. The main purposes of the PMG are to

support the establishment of the scheme during all phases, working closely with both government representatives and concessionaires, and to manage the project once launched.

After the initial launch of the project, the PMG will focus on assisting the concessionaires with capacity building to meet the requirements of the certifications. The PMG will additionally be involved in the monitoring of the implementation of the forest management plan at the concession level. By the PMG's fulfilling this role, the monitoring requirements at this level can be lowered, and the risks of concessionaires' failing in the process can be managed before the CCs are issued.

The composition of the PMG is dependent on the country and local circumstances. In general, the PMG should include:

Steering Committee:

- Representative(s) from the government
- Representative(s) for the concessioners
- Representative(s) of the certification body
- Representative(s) of the accreditation body (issuing accreditations to carry out the FSC or PEFC-based certifications; in FSC accreditation, the accreditation body is FSC, whereas in PEFC it is a national or regional accreditation body (for a list, see www.iaf.nu))
- Representative(s) of the financier?
- Technical operation advisor

Technical advisors:

- Certification experts (SFM, CC)
- Research expert on carbon allocation and dynamics in ecosystems, and the monitoring thereof
- Monitoring expert
- Forest management expert

Format:

- NGO
- Private company
- Others?

N.B. Regardless of the format, there is some linkage to the government through the steering committee; therefore, it most likely cannot purely be an NGO. It would instead need to be an independent institute, an organisation, or a semi-governmental company.

c) **Concessionaire**

By definition, concessionaires are a person, group, or company to whom a concession has been granted. Eligibility will depend on each country's concession rules.

d) **Certification Body**

A certification body is an independent, impartial legal entity that carries out conformity assessment of management, production, services or products to specified standards, and issues certificates of conformance. A certification body may apply for accreditation to

demonstrate its competence to carry out conformity assessments related to specific certification procedures, e.g. forest certifications under FSC or PEFC frameworks.

e) **Carbon Credit Certification**

Although ideally there would be a full integration of SFM and carbon standards, such a reality does not yet exist. Therefore, when developing a technical scheme, one needs to look into an alternative way to implement the idea. Therefore, existing CC certification schemes should be considered to a certain extent when describing and devising the technical scheme.

Concerning forest carbon, there are mainly four third-party schemes available to the market:

- Community, Climate, and Biodiversity Standard (CCBS)
- CarbonFix Standard (CFS)
- Plan Vivo Systems and Standard
- Agriculture, Forestry and Land Use (AFOLU) Voluntary Carbon Standard (VCS)

1.1.2 Flow of Activities – Steps in Describing the Scheme

Step 1
Establishment of the PMG.

Step 2
In order to have a functioning scheme, the government gives out concession rights to selected concessionaires alongside reduced tax fees. This is done according to rules laid out in national or regional laws.

As the assumption is that the concessions do not hold any certificates in the beginning, the PMG plays an active role in providing support and technical assistance to the concessionaire. As an example, during the first phase, the PMG will create a step-by-step program to assist the concession management in meeting the certification requirements. The goal of this is to facilitate the involvement of the concessions and to shorten the establishment time of the REDD+-project.

Steps 3 and 4
The Concessionaire develops a management plan in line with the terms of the concession contract for the area. This plan is often submitted for approval to an authority. The concessionaire then carries out the forest management according to the plan. In cases of certification, the contracted certification body performs an audit in which the forest management in the concession area(s) is assessed against a specified standard for compliance. This audit consists of (1) a document review, where the certification body assesses the forest management plan and other relevant management documents; and of (2) a field audit where the certification body assesses whether the practical procedures and operations are in line with the plans, guidelines and standard requirements.

If the standards against which a certificate will be issued include C&I that set requirements for and measure carbon sequestration and storage through reduced deforestation or degradation, a concessionaire applying for a certificate must take these requirements into consideration in the forest management plan and related management documents (guidelines, records, etc.), and manage the forests accordingly. Over time and through regular monitoring, which is already required for annual internal and third-party surveillance audits, the concessionaire can demonstrate evidence of accumulated CCs.

If the forest management plan 1) makes a strong commitment to changing the trend in degradation and deforestation; 2) includes measures to conserve and monitor the carbon stock and sequestration in the concession area; and 3) complies with the other requirements for SFM, a certification body can then issue an SFM + REDD certificate already at an early stage of the certification. The REDD Project organisation defines the rules for counting the CCs as they accumulate over the years. Thus, a concessionaire would have a certificate for Year One that would provide evidence of a type of SFM that conserves carbon stocks and sequestration potential in the concession. In the Year One + n, the accumulated additional carbon stock and sequestration will have reached the level of z CCs, which can be registered and traded according to the rules of the REDD Project.

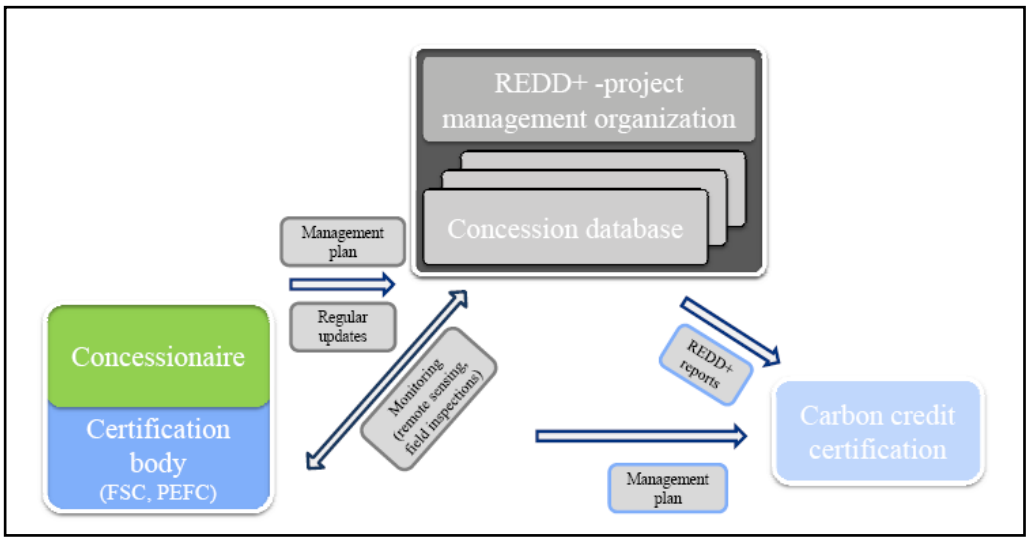
The focal issue is to formulate the carbon-related C&I in such a way that sets a relevant, fairly universal objective and elicits relevant and measurable information pertaining to the development of carbon stock and sequestration. The carbon C&I should be further expanded upon from the current basic requirements to maintain forest resources, by taking advantage of the current research on carbon balance and allocation in different forest ecosystems, and by recognizing the practical limitations of measurement of sophisticated verifiers in concession areas. Despite the difficulties, a multidisciplinary approach can yield feasible indicators for the estimation of the carbon balance in a forest ecosystem, taking also into consideration the trends in deforestation and degradation.

Steps 5-7
Once the concessionaire has obtained a certificate, the continuous monitoring phase of REDD+ begins. A potential monitoring system is presented in Figure 1.2. The monitoring is based on two simultaneously operating systems, one through the concession and one through PMG. The concessionaire is required to have a regularly updated compartment database. More detailed monitoring is performed by PMG. For each concession, a concession database is designed based on the management plan and initial field inventory. The database is regularly updated according to the pre-harvesting inventory reports as well as thinning- and harvesting reports submitted by the concessionaire. To verify the veracity of the reports and the database, PMG performs regular monitoring of the concessions by means of high resolution satellite imagery based remote sensing, and, if needed, additional field inspections.

Once the concession is able to generate REDD credits (most likely in five years after the start of the project), it will send the reduced emissions report to the third-party certifiers. They would then verify the information on the concession grounds and in the PMG supplementary, approved monitoring reports in order to issue the carbon credit (CC) certificate. SFM certification includes annual surveillance audits that would also address the carbon-related criteria in the standard. The definition of the feasible cycle of more comprehensive REDD+ auditing requires further consideration and can vary according to the ecosystem and/ or forest management regime.

The purpose of continuous monitoring by PMG is two-fold. First, the monitoring reduces the amount of the concessionaire's monetary investment into the monitoring system. Second, the monitoring evaluates the concessionaire's ability to produce carbon credits, and therefore reduces the risk of the concessionaire's failing to garner carbon credits. PMG has a conflict of interest with the generation of carbon credits, so the monitoring reports it produces are considered to be only supplementary to the concessionaire's report during the third-party certification proceedings.

Figure1.2 Potential Monitoring System



Step 8
Once the concessionaires receive the CC from the certification body, they transfer the credits to the PMG as compensation for the reduced concession fees.

1.2 Benefits and Costs to Stakeholders

Group of Stakeholders	Benefits derived from scheme	Avoided Costs/ Additional revenues
Government	1. Higher tax compliance 2. Increased tax revenues 3. Reduced illegal logging 4. Reduced illegal activities 5. Better forest management through incentives to protect the resource (SFM and C) 6. Improved data on forest resources 7. Better protected rare species and wildlife are	1. Reduced forestry oversight costs for state agencies 2. Higher revenues in the long-term, due to the decrease in forest degradation
Concessionaire	1. Price premium and market access (SFM) 2. Compensation for carbon credits 3. Systematic, documented management and monitoring 4. Reduction of social conflicts among timber companies and local communities 5. Improved forest management practices (safety, staff competence, procedures, etc.) 6. Introduction of more lesser- known species into the marketplace 7. Improved reputation of the forestry sector	1. Reduced costs related to accidents, low quality work, or unforeseen damages

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Annex 1

Group of Stakeholders	Benefits derived from scheme	Avoided Costs/ Additional revenues
	8. More willingness on the part of banks to give loans to certified firms	
Workers, local people	1. Improved engagement and consideration of needs 2. Better awareness and competence 3. Safer working techniques	
Climate change community	1. Integration of climate protection with practical forest management at an operational level 2. Increase in the efficiency of measures that use forests in climate change mitigation 3. Integration of criteria addressing climate change in SFM	1. Avoidance of undesired adverse impacts on environment, since stakeholders of the measures use forests as the source of carbon credits
Certification schemes	1. Integration of climate change mitigation, the core element of sustainable development, into existing and well operating certification schemes	1. Potential use of existing certification infrastructure that only needs added criteria to address carbon stock and sequestration.

The administration of the REDD scheme and maintenance of adequate resources for forest inventories and forest management planning are the main capacity requirements for government organisations. Forest managers are responsible for both the costs related to performance improvements that meet the level of SFM certification or REDD monitoring and the costs of third party auditors. Certification also includes license costs, especially if it gives the right to use a product label.

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