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# A Sustainability Framework for Enhancing the Long-Term Success of LULUCF Projects

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## Abstract

Collateral impacts of LULUCF projects, especially those concerning social and environmental aspects, have been recognised as important by the Marrakech Accords. The same applies to the necessity of assessing and, if possible, of quantifying the magnitude of these impacts. This article aims to define, clarify and structure the relevant social, economic and environmental issues to be addressed and to give examples of indicators that ought to be included in the planning, design, implementation, monitoring, and *ex post* evaluation of LULUCF projects. This is being done by providing a conceptual framework for the assessment of the sustainability of such projects that can be used as a checklist when dealing with concrete projects, and that in principle is applicable to both Annex I and non-Annex I countries. Finally, a set of recommendations is provided to further develop and promote the proposed framework.

*Keywords:* LULUCF projects, CDM, Kyoto Protocol, Sustainability, Socio-economic impacts, Environmental impacts

# 1 Introduction

In the general climate policy discussion, land use and land-use change and forestry (LULUCF) projects have so far been primarily regarded as technical measures aiming to reduce GHG emissions or to enhance carbon sinks. Nevertheless, LULUCF projects can have a wide range of environmental (Schulze et al. 2002), social, and economic impacts. The Marrakech Accords recognized the importance to appropriately assess these impacts and asked the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention of Climate Change (UNFCCC) to develop definitions and modalities for LULUCF projects within the Clean Development Mechanism (CDM) (UNFCCC 2002ab).

According to the developments within the context of the CDM this paper is based on the thesis that LULUCF activities in Annex I countries do have a broad range of important environmental and socio-economic impacts that ought to be taken into account when these activities are planned, implemented, monitored, and assessed (Robledo and Blaser 2001).

But even if the importance of social, economic and environmental issues has been recognized, their definition as well as criteria and indicators and concrete methodologies to address them throughout the project cycle have turned out to be highly challenging and intensively debated subject matters. Discussions on these topics have been influenced by different interpretations of the concept of sustainable development (Merbatu 1998; Musters et al. 1998; Kelly 1998) as well as by the potential implications that decisions on LULUCF projects can have on national sovereignty and on property and use rights. Evidence for this has been provided by the vague manner in which socio-economic and environmental impacts are treated in the text on the modalities and definitions for the inclusion of reforestation and afforestation under the CDM. In the proposal presented by the Secretariat of the UNFCCC, which is based on the submissions presented by a number of parties, there are no criteria set or methodologies proposed to address socio-economic impacts. Regarding environmental impacts the so-called *"options paper"* just mentioned the possibility of using environmental impact assessments (EIAs) (UNFCCC 2002c).

In order to pave the way towards a more comprehensive and systematic assessment of LULUCF projects along their life cycle, this article intends to structure those social, economic and environmental issues that play a significant role during the life span of a LULUCF project. In particular, this article firstly proposes a *"sustainability framework"* for the assessment of LULUCF projects along their entire life span. The proposed framework tries to be ethics-based (Peet and Bossel 2000) and aims at creating sustainable projects, in which credibility and legitimacy are enhanced by applying a variety of institutional mechanisms that facilitate communication, translation and mediation across boundaries (Cash et al. 2003) between project investors in the North and host communities in the South. Based on this framework we will define key social, environmental and economic issues that can be used as a basis for a project checklist. This kind of list would be useful for project developers as well as for project evaluators. Secondly, and based on some real world LULUCF project experience, the article presents specific recommendations on how to further develop and promote these issues in order to bring them into practical use for the design and management of sustainable LULUCF project activities.

The article also considers the formal decisions that have been taken by the Conferences of the Parties (COPs), and especially those embodied in the Kyoto Protocol, the Bonn Agreement, and the Marrakech Accords. Furthermore, the article discusses social, economic, environmental and

institutional issues relevant for LULUCF projects, with special consideration of activities aimed at mitigating GHG emissions, enhancing sinks, and promoting the use of bioenergy.

The authors propose and maintain the thesis that the issues discussed are valid both for Annex I and non-Annex I countries, while the concrete impact of a specific issue on the performance of a LULUCF project as well as its conflict potential will depend on the specific situation of each project.

## 2 Sustainability framework for LULUCF projects

Considering our first objective, in the following chapter a conceptual framework is presented. It proposes a hierarchical framework for the sustainability assessment of LULUCF projects (figure 1). The taxonomy used to indicate the elements at different hierarchical levels was carefully chosen. The framework is inspired by the one proposed by Lammerts van Bueren and Blom (1997) in the context of the formulation of criteria and indicators for sustainable forest management.

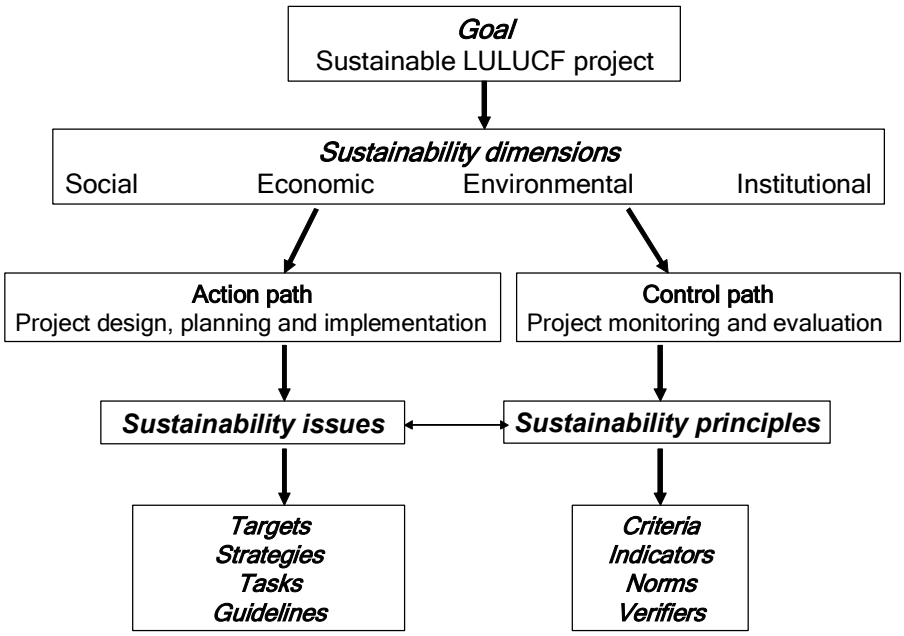


Fig. 1. Structure of the hierarchical framework for the sustainability assessment of LULUCF projects.

On top of the hierarchy is the overall goal to promote and implement *a sustainable LULUCF project*. Goals are broad, qualitative statements about objectives (Parris and Kates 2003). The specific goal here is fundamentally included in the UNFCCC and the Kyoto Protocol (UNFCCC 1997). It is based on the logic that any strategy aimed at achieving the stabilization of the world's climate should not provoke any other significant environmental, economic, or social burdens.

The *sustainability dimensions* form the next hierarchical level, which is a new level compared to Lammerts van Bueren and Blom (1997). One could have opted for the definition of only two dimensions: nature and mankind. The problem with this classification is that many environmental

issues, which are important for conservation, are equally important for mankind (e.g. water availability). In many cases, therefore, this interrelatedness makes a lucid mapping very difficult.

Another option could have been to let the dimensions coincide with the three pillars of sustainability generally accepted since the Rio Conference, i.e., the social, economic, and environmental pillar. The problem here is that many aspects of sustainable development are being regulated or institutionalized, suggesting that these institutional aspects may be considered a dimension on its own. Such a fourth – institutional – dimension could include all *enabling conditions* to reach sustainability, like human and property rights, laws and their enforcement, education and capacity building, etc. Lammerts van Bueren and Blom (1997) considered these enabling conditions as non-essential aspects of sustainable forests ad proposed to put them lower in the hierarchy on the level of indicators (figure 1), while others put them on the level of principles (e.g. FSC) or criteria (e.g. International Tropical Timber Organization - ITTO). Although this is an interesting reasoning, in this article an even more pragmatic way is followed. Throughout the article, we consider institutional aspects as belonging to the top of the hierarchy, i.e. to the dimension level. This corresponds to the fact that LULUCF projects, especially after the Marrakech Accords, are necessarily embedded in formal and informal institutional environments. Therefore, we come up with four sustainability dimensions, being the social, economic, environmental, and the institutional dimension.

At this level of dimensions, the complexity of sustainability within a LULUCF project is understood as a *multi-objective goal programming exercise*. This aims at simultaneously maximizing the stability of both nature and human society by optimizing and harmonizing between the social, economic, environmental and institutional dimensions, irrespective of whether they are in line with each other or diametrically opposed.

For each of the four dimensions a number of *issues* were identified. Issues are big topics concretizing the dimensions. For each issue a corresponding *principle* is formulated. Principles are basic rules of sustainable development, typically formulated as a commandment. Issues and principles differ from each other in that issues have a positive, promoting connotation and are inviting for the implementation, whereas principles have a more normative connotation and allow for the evaluation of sustainability.

Issues and principles are brought into practice through two parallel paths, the *path of action* and the *path of control*. The path of action emanates from the issues and includes project design, planning and implementation. The parallel path of control emanates from the principles and includes the necessary internal and external control mechanisms of monitoring and evaluation.

The path of action starts with the translation of each issue into a number of *targets* and *strategies* for the longer term. A target is a long-term planning objective aiming at the implementation of a principle. Strategies are long-term methodological lines followed to reach a target. Targets and their derived strategies are then concretized into subsequent action plans, setting detailed project *tasks*. A task is a concrete item of an action plan to be implemented. These project tasks are implemented following a number of guidelines of best practice, adapted to the relevant level of time, scale and responsibility. Finally, a *guideline* is a practical set of instructions aiming to reach a specific target.

The path of control starts with the translation of each principle into *criteria*. Criteria describe the state of the system under compliance with a sustainability principle. It is formulated as a statement to allow a verdict over the question of whether the evaluated situation is sustainable or not. Hence, a correctly formulated criterion requires a clear-cut 'yes' or 'no' answer.

The question of whether a criterion is met or not can be tackled by using suitable *indicators*. An indicator is a variable whose score indicates the level of compliance with a criterion. Indicators must be measurable variables sensitive to the compliance of a criterion. In cases where a minimal level of compliance is expected, *norms* can be defined in addition. Norms indicate a well-defined indicator value, setting the boundary between compliance and non-compliance to a criterion. Finally, a *verifier* is a tool or instrument to measure an indicator. Table 1 shows two examples that illustrate the functioning of the framework just described.

Table 1. Examples for the social and environmental dimension to be used in the hierarchical framework for design, planning, implementation, monitoring and evaluation of LULUCF projects

| HIERARCHICAL LEVEL | EXAMPLE 1 | EXAMPLE 2 |
|---|---|---|
| Aim | Sustainable LULUCF project | Sustainable LULUCF project |
| Dimension | Social | Environmental |
| ACTION PATH: | | |
| Issue | Stakeholders' well-being | Ecosystem protection |
| Target | Project workers' safety | Erosion control |
| Strategy | Training | Soil erosion prevention |
| Task | Organisation of demonstration and training sessions for forest workers on safety prescriptions | Preventive erosion control during road construction works |
| Guideline | Best practice guidelines on work safety | Guideline for good environmental practice concerning the protection of stream flows during road construction works |
| CONTROL PATH: | | |
| Principle | The well-being of all stakeholders shall be maintained and, where appropriate, improved | The protection function shall be maintained and, if appropriate, enhanced |
| Criterion | Permanent safety training of forest workers is organized | Soil erosion is minimized |
| Indicator | Number of work accidents/month | Annual sediment loss in tonnes/ha |
| Norm | Maximum 1 accident per 100 person-months | Maximum soil loss = 10 tonnes/ha/year |
| Verifier | Statistics from local community health centre | Calculation of USLE (Universal Soil Loss Equation) |

As already mentioned above, the present article constitutes an attempt to identify the main social, economic, environmental, and institutional issues that can contribute to the long-term overall success of greenhouse gas mitigation projects (in our case the main focus is on LULUCF projects). For each dimension, all relevant issues are first summed up. A next step, beyond the scope of this article, will be the further elaboration of these issues into principles, criteria and indicators at the national and/or international level.

## 2.1 Social issues

The option papers on definitions and modalities for reforestation and afforestation activities within the CDM propose the following four alternatives to address socio-economic issues related to LULUCF projects (UNFCCC 2002c):

- Minor revisions to existing modalities and procedures;
- More extensive revisions to existing modalities and procedures, possibly also including the elaboration of "checklists" or annexes to the modalities;
- Countries (host and/or investing country) elaborating country-specific guidelines to address socio-economic impacts;
- Executive Board of CDM developing operational guidelines to address socio-economic impacts.

Decisions on this matter were taken during the last meeting of the parties, COP 9 in Milan/Italy, held in December 2003. Both for the discussion before the next COP meeting in Buenos Aires/Argentina (December 2004), where the yet unsettled modalities for small-scale projects will need to be fixed, and for the implementation of any decision, it will be especially relevant to clarify which issues should be considered under each dimension and – as far as possible – how these issues can be appropriately addressed.

For the social dimension we have identified ten issues to be tackled: (1) identification of social groups and social system; (2) land tenure and land-use rights; (3) perception of affected social groups; (4) credibility; (5) participation; (6) social acceptance; (7) communication; (8) local capacity building; (9) equity; and (10) livelihood improvement.

(1) Identification of social groups and social systems.

Considering a society as a system, the social dimension refers to the interaction between different social groups, and their interactions with the rest of the system. Social groups result from classifying stakeholders according to specific variables (e.g. income level, land tenure, education level), or by combining such variables. In a given region, project developers can find different groups – like indigenous people, settlers and concessionaires. Each of these social groups will have specific interests and roles, and will be differently affected by the proposed LULUCF measures (Robledo and Blaser 2001). Project developers have to be aware of the possible presence of different interests among the affected social groups in the project region, their perception of opportunities and necessities, their understanding of the problem and their acceptance of the proposed measures to solve the problem. Project developers should also be able to understand the functioning of the social system by recognizing possible interactions between stakeholder groups. It includes the identification of potential conflicts and synergies as well as the understanding of the influence that different social groups can have on the project. In some cases project developers should define a *target group* of the project, and define ways to enhance its participation, to distribute project benefits, and to establish strategies that diminish inequities and reduce potential conflicts.

(2) Land tenure and land-use rights.

A main issue in the development of LULUCF projects is the accessibility to forest resources. According to the Marrakech Accords, ownership of the land for LULUCF projects has to be clarified in order to establish eligibility of the projects (UNFCCC 2002b, Add.1). This is especially important for forestry projects under the CDM. Dealing with land tenure in the host countries of CDM-LULUCF projects should take into account customary rights and the particular needs of local social groups. Land tenure and land use rights refer to many forms that determine the property and possession status of land as well as the possible use of natural resources. Land tenure rights include public, private and community ownership, while rights of use include different agreements that allow specific social groups the access to specific resources. Some of these agreements cover concessions, collaborative management, or land renting. However, in many cases territories are just possessed by different social groups, without having legally binding arrangements to property rights or rights of use. Possession can be based on customary rights, which are sometimes neglected by legal arrangements at the national or regional level (Blaser and Hussein 2000). In those cases, in which land tenure and land use rights are not properly arranged, or where the rights of local communities are not adequately recognized, LULUCF projects can prevent inequities by promoting new legal arrangements between the affected social groups. Because land tenure and land use rights are an important basis for LULUCF projects, an equal regime that considers customary rights and necessities of local social groups should be promoted by project developers.

(3) Perception of affected social groups.

Once a project area has been defined and the local social groups have been identified, project developers should ensure that there is a common problem understanding or common perception of the local situation. In a specific region a LULUCF project can have different meanings. For carbon credit buyers a project can primarily constitute a possibility to reduce GHG emissions or to get CERs in a cost-efficient way, while local social groups will see the project as a welcome possibility to improve local income, or as a new way for capacity building. In some cases a LULUCF project will change consumption patterns (e.g. switching from fossil fuel use to bioenergy, or reducing wood fuel consumption through more energy-efficient stoves) or production patterns (e.g. using modern machinery and/or processed biofuels). Some local social groups are perhaps not aware about the local and global consequences of climate change and hence will not see any necessity to change current social patterns. For these reasons before and during the planning of a LULUCF project, project developers should explicitly consider the different problem (and solution) perceptions among different social groups and, if necessary, implement strategies to promote a common problem and solution understanding.

(4) Credibility.

In order to promote a common problem and solution understanding project developers should be able to mobilize affected social groups. Mobilization depends on the experience and credibility that project developers can demonstrate to the different social groups. In order to improve local confidence, project developers should seek strategic alliances with local institutions and opinion-leaders, which are both credible and have experience at the local level. Through such alliances project developers can mobilize different social groups to participate in the project and also get commitments.

(5) Participation.

Participation of affected social groups in a LULUCF project depends on the local socio-cultural structures and involves many different topics. Such topics include the access to project information, project formulation and decision-making, or to capacity building. The consideration of these structures and fields allows project developers to design participation mechanisms for a project in a better way.

Through these mechanisms the interests and necessities of social groups will be considered during the project planning and implementation phases, and will be taken into account for the designated monitoring and verification processes. Moreover, participation of social groups helps to encourage project transparency and to promote the empowerment of local social groups.

(6) Social acceptance.

Through promoting social acceptance of technical measures, project developers will be able to alter local production or consumption patterns in a way that results in a reduction of GHG emissions, or an enhancement of carbon sinks. Social acceptance is based on a common understanding of the problem as well as on participation in the design of LULUCF activities. Only social groups that are fully aware of a common problem and that have been mobilized to participate in the design and planning of a project, will be able to commit themselves to, and to actively influence, a particular project's scope, objectives, and planned activities.

(7) Communication.

Diffusion of innovation theory (Rogers 1995) is very useful to better understand how (subjectively) innovative ideas, such as LULUCF projects, are spread and adopted among social groups. Different adopter categories, for example, use different communication channels, and an interesting finding of many empirical studies is that in the diffusion process interpersonal communication tends to be relatively less important for earlier adopters than for later adopters of an innovation (the opposite applies to mass media communication channels). Besides, the rate of adoption of an innovation depends on many factors, such as the (in all instances perceived): *relative advantage* (benefit gained compared to the idea or situation it supersedes), *compatibility* (with existing values, past experiences, and adopters' needs), *complexity* (for understanding and/or implementing and using), *trialability* (e.g. experimentation on a smaller scale), and *observability* of the innovation (to others). Also important is the issue of whether the decision about the innovation is optional and taken by an individual, or taken consensually by some collective body, or by some authority (on the basis of power, status, or technical expertise).

Communication patterns can differ considerably, depending on tradition, access to and local acceptance of media (e.g. radio, television, oral tradition). Considering communication implies, among other aspects, understanding local patterns to transmit information, to get access to media, as well as to find possibilities to improve communication between local social groups and project developers. By improving communication patterns, project developers will promote discussion on controversial elements of the project during the design phase. At this step it is easier to find solutions and to promote commitments than during the actual implementation phase. Project developers should consider the elaboration of a communication strategy that allows different social groups affected by a LULUCF project to participate in the process of project design.

(8) Local capacity building.

Capacity building increases the local ability to understand the problem, to propose technical, institutional and social measures and to include local capacities during the LULUCF project cycle. Through capacity building the understanding of a specific problem will be promoted for social groups and the needs and preferences of each social group will be better defined. In this sense capacity building not only refers to training in technical measures, but also to the promotion of local opinion leaders, which are essential for fostering the acceptance of LULUCF projects. Using and promoting local communication patterns and offering capacity building and exchange for local social groups can be more expensive at the beginning of a LULUCF project than towards the end because of learning effects (e.g. Abell and Hammond 1979). Nevertheless, such investments are paramount in order to warrant a certain degree of social acceptance for technical measures.

(9) Equity.

Equity can be understood under geographical or under social considerations. From a geographical point of view equity refers to the regional and subregional distribution of projects. In the annex to decision 17/CP7 it is clearly agreed that the Conference of the Parties (COP) on report by the Executive Board (EB) should review equitable geographic distribution and identify systematic or systemic barriers for an equal spread of CDM projects (UNFCCC 2002b, Add.2). Social equity, in contrast, should be considered by project developers, in that they should promote a fair distribution of the benefits and disadvantages of a project between the affected social groups. As equity concerns are at the same time subjective and also essential for sustainability, project developers should define participatory mechanisms beyond the design phase.

(10) Livelihood improvement.

LULUCF projects affect livelihoods in many ways. On the one hand, projects can enhance sustainable practices, changes in production and consumption patterns, environmental performance (reducing adverse impacts on nature and human health), and provide additional funding for new activities. On the other hand, these projects can be very challenging regarding land tenure legislation, participation, equal distribution, or technical matters such as baseline definition or monitoring. LULUCF projects can foster a secure and sustainable access to basic forest goods and promote the use of bioenergy from sustainable wood production, especially for poor communities. Some experiences, like the Noel Kempf Project in Bolivia or the San Nicolás project in Colombia (ITTO 1999), demonstrate that LULUCF projects can indeed promote livelihood improvements. However, in both cases initial investment in a participatory process was needed.

## 2.2 Economic issues

We have identified the following five issues to be considered along the economic dimension: (1) financial additionality; (2) local employment creation; (3) improvement of local income; (4) enhancement of the local/regional economy; and (5) market development.

(1) Financial additionality.

Contrary to the requirement of environmental additionality, CDM projects do not have to demonstrate financial additionality to the baseline. Nonetheless, they have to be additional to any Official Development Assistance (ODA) granted. Particularly, financial additionality was defined within the UNFCCC context as follows: "… *funding for the implementation of CDM projects must not be provided by developmental and environmental assistance funds. This applies to country level Official Development Assistance (ODA) transfers, funding mechanisms under the Framework Convention on Climate Change, and the various multilateral development bank and development agency activities. It is likely, though, that projects may be able to receive developmental funds for activities not related to the implementation of the project, such as capacity building, training, or feasibility studies*"

However, discussions about the additionality of CDM-LULUCF projects are now concentrated on the definition of additionality as it is given in the Marrakech Accords: "*A CDM activity is additional if anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project* " (UNFCCC 2002b, Add.2, §43 Dec.17/CP7).

It is clear that the implementation of activities within a CDM-LULUCF project cannot be financed through ODA funding. Nevertheless, what remains a matter for discussion is whether bilateral cooperation can be used to support the design phase, especially in those cases where local project developers do not have enough resources to do this themselves.

(2) Local employment creation.

LULUCF projects can be a source for creating and/or maintaining local employment opportunities. Different types of employment effects can be distinguished: *Direct employment* results from operation, construction, and production. In case of reforestation projects combined with bioenergy systems, for example, this refers to total labor necessary for crop planting and production or construction, operation and maintenance of conversion plants, and for transporting biomass. *Indirect employment* results from all activities connected, but not directly related, like supporting industries, services and similar. The higher purchasing power, due to increased earnings from direct and indirect jobs may also create opportunities for new secondary jobs, which may attract people to stay or even to move into a region. These latter effects are referred to as *induced employment*.

(3) Improvemement of local income.

As payments for carbon credits can diversify local income, LULUCF projects will have a significant impact in sustainable development in many regions. Calculations made for the San Nicolas project in Colombia prove that just through the selling of CERs that arise from the project it will be possible to establish the agro-forestry systems that the local groups have defined as strategic (EcoSecurities 2003). Other well-documented experiences, like the Noel Kempf project in Bolivia or the different experiences made in recent years in Costa Rica, demonstrate that it is necessary to warrant the improvement of local income in order to really promote long-term good practices in the sector (Smith and Scherr 2002).

(4) Enhancement of the local/regional economy.

Avoidance of carbon emissions is an added bonus for local communities, but the primary driving forces are much more likely to be the creation of local income, value added, and employment. Consequently, such benefits will result in increased social cohesion and stability that stem from the introduction of an income- and employment-generating source. The quantification of such benefits will contribute to the effective promotion and implementation of projects by gaining the support of and mobilizing the dedicated stakeholders (e.g. environmental and other interest groups, local communities, individuals, etc.). For instance, forestry and bioenergy projects and activities have provided millions of households with incomes, livelihood activities and employment. Many farmers would welcome the opportunity to sell forest and agricultural residues or purpose-grown energy wood or crops to long term, steady consumers. Producing biomass provides a new source of revenue and helps farmers to diversify their production. This reduces the vulnerability, say, to crop failures or declining crop prices, especially if the biomass is derived from trees – i.e. a secure standing asset that can be harvested as the demand arises. Tree planting, in particular of crop species like those used in agro-forestry systems, have rewards in terms of improved agricultural productivity and food security, as well as some collateral environmental benefits like the improvement of watersheds or soil conservation.

Participants in bioenergy and forestry activities learn skills they can transfer to other profitable activities. Policy makers increasingly recognize that there are added economic benefits from renewable energy sources, and in particular from bioenergy use, especially in terms of employment creation, reduction of import dependence, and the development of a strong renewable energy export industry (technology, services, biomass fuels). In Europe, for example, the renewable energy industry is one of the fastest growing sectors of the economy (UNDP/UNDESA/WEC 2000, Ch. 7; Neij 1997). The main concern here is whether LULUCF project earnings are expected to be high enough to make it worthwhile to mobilize local resources for implementation.

(5) Market development.

One of the most important advances due to the Kyoto Protocol is the creation of an international market for carbon credits. This market allows the payment of forest environmental services (emission reduction through forest management and carbon sequestration) and improves the value of some forest products through the possibility to undertake projects with a component in carbon substitution. Further development of this market to a self-sustained level represents a huge challenge both for policy makers and project developers.

## 2.3 Environmental Issues

The environmental dimension can be further translated into five issues that we have derived from the globally agreed criteria for sustainable forest management (FAO/ITTO 1995, Castañeda 2000). These issues are: (1) GHG balance; (2) ecosystem area; vitality and condition; (3) sustainable productive capacity; (4) biodiversity; and (5) protection function.

(1) GHG balance.

The GHG balance issue is essential in LULUCF projects, because making a positive contribution to this balance is their ultimate aim. Putting it as a principle, the overall GHG balance of the pro-

ject should be positive. In the general framework of forest sustainability, however, this aspect is normally considered at the level of a criterion under the protection function of the forest, next to other protection functions, such as erosion control, control over the water flows, etc. (e.g. FSC principles for sustainable forest management (SFM), Helsinki and Montreal criteria for SFM). In the Kyoto context, however, it becomes a major principle on its own. This principle can then be further worked out in detail using a number of criteria, which have been discussed in detail by other authors (Schlamadinger and Marland 2000; Verbeiren et al. 2000): Criteria to consider are:

- Additionality of the project is demonstrated. It means that the project effectively creates new forests, which would not have been realized without the project in an area that was not forested in or after 1990.

- The baseline scenario of the project system has been analysed, i.e. the evolution of the GHG balance of the project area without the project, taking into account the expected socio-economic trends.

- Factors of non-permanence (*leakage*, i.e. unforeseen GHG emissions from the project. space/time; *slippage*, i.e. unforeseen GHG emissions outside the project space/time as a consequence of the project; *fate* of GHG after project expiry) are identified and minimized.

- The project's GHG mitigation performance (the quantified level of GHG emission reduction) is monitored continuously and is satisfying.

(2) Ecosystem area, vitality, and condition.

The ecosystem area, vitality, and condition issue deals with the principle that the project should not lead to deforestation, ecosystem destruction, or any decline in ecosystem vitality and condition. LULUCF projects can promote or endanger vitality of an ecosystem depending on the project activities. Restoration and rehabilitation of forest lands can offer an opportunity to use LULUCF projects to maintain or enhance biological diversity and ecosystem vitality (ITTO 2002).

(3) Sustainable productive capacity.

The production issue is based on the principle that ecosystem productivity shall be maintained, forest regeneration shall be secured, and sustainable harvest shall be promoted. Similar as in the numeral above, LULUCF activities can promote diversification on income sources in forestry, while at the same time reducing stress on one specific product (e.g. wood). This kind of diversification will then turn to an important factor to enhance sustainable productive capacity of this ecosystem.

(4) Biodiversity.

The biodiversity issue aims at the conservation of biodiversity and the protection or restoration of the ecological processes sustaining biological diversity. This issue fits in a major concern for a better coordination between the UNFCCC and the United Nations Convention on Biological Diversity (UN CBD) (Brown 1998; Orlando and Smeardon 1999). Schulze et al. (2000) pointed out that major hotspots of biological diversity are at risk under the mandate of the FCCC, espe-

cially in the case of afforestations with exotic species, eventually on land that never had any forest cover. Formulated as a principle, biodiversity and ecological processes shall be conserved and protected and, where appropriate, restored. Possible criteria figuring under this principle are:

- Existing biological, genetic and habitat diversity are maintained and conserved where necessary.
- Numbers, area and distribution of landscapes, forest types and habitats with specific biodiversity values are conserved.
- Plantation forests are only accepted if they do not replace natural forests, demonstrate to decrease pressure on the natural systems, and demonstrate local socio-economic benefits.
- Afforestation/reforestation makes maximal use of native species; exotics are either not allowed or subject to a number of restrictions.
- The use of biocides, fertilizer, genetically modified organisms, non-native plant, animal, pest and disease species is not allowed or regulated under strict conditions.

(5) Protection function.

The protection issue includes the maintenance and strengthening of the environmental functions of the ecosystem, such as soil and water conservation, but with the exception of global climate stabilization, which is included in the GHG balance issue.

## 2.4 Institutional issues

Institutional issues are strongly interrelated with the other issues described and integrate these in organisational structures. For example, while in the section on social issues we considered the relationship between different social groups affected by a LULUCF project, in the present section we include the compendium of rules and institutions that regulate this relationship at the local, regional, or national level.

Institutional issues can be external or internal to the project. Issues *external* to the project are the (1) institutional capacity and (2) institutional agreements. Issues *internal* to the project are in fact managerial issues, and comprise the (3) managerial, infrastructural and technological capacity, and (4) project reporting and performance controlling.

(1) Institutional capacity.

Mitigation strategies constitute a huge challenge for the institutional capacity of countries or any other territorial bodies. For instance, in many countries climate change mitigation activities are being undertaken in different ministries and often insufficiently coordinated. In the specific case of LULUCF projects the Ministries of Environment, Agriculture, Forestry and – especially in the case of bioenergy – Energy are the ones that are typically involved. National policies to reduce $CO_2$ emissions may undermine national policies to further develop the energy sector, or imply some rise in prices that can be politically undesirable or socially unsustainable. In principle, sustainable LULUCF projects should actively contribute to the institutional capacity building by

stimulating the institutionalization of the social, economic, and environmental principles and by stimulating the creation of an effective legal framework for their operation.

(2) Institutional agreements.

Institutional agreements will be necessary between institutions in order to reach a more integrated policy, but also between the project and the institutions. The success of the project shall indeed be ensured by institutional agreements with national and local authorities and with NGOs present in the country in question. Under this principle, the following criterion could be formulated: the project is covered by a letter of intent signed by the investor and the hosting country's authorities, stating that:

- The project conforms to the criteria stipulated in Articles 6.1 and 12.5 of the Kyoto Protocol.
- The project meets the environmental and development priorities of the guest country.
- The project conforms to the criteria for Kyoto projects of the investor country (provided they exist).
- The project conforms to the criteria for Kyoto projects of the guest country (provided they exist).
- The project is not in conflict with the implementation of other international treaties and conventions, such as CITES, RAMSAR, CBD, and CD.

(3) Managerial, infrastructural, and technological capacity.

Concerning the capacity of the project, the initiator shall demonstrate sufficient capacity on the managerial, infrastructural, and technological level to successfully implement the project and monitor its performance over the project's lifetime. The project shall be managed through a regularly updated management plan and its progress shall be communicated through transparent annual reporting.

(4) Project reporting and performance controlling.

The project's development shall be reported through a transparent annual reporting scheme, which also contains a detailed evaluation of the project's performance and financial management matters (e.g. spending of external funding and revenues from operation).

## 3 Policy recommendations

Now that issues have been defined, a number of policy recommendations are made to bring this framework into practice. We are aware that this list can and should be further completed according to present and future theoretical advancements and practical (in-the-field) experiences. In what follows, after providing some general recommendations, more specific recommendations concerning the sustainability issues are put forward.

### 3.1 General recommendations

- Issues are universally applicable.
- Targets, strategies, tasks and guidelines are project-specific and must be developed during the project design and planning phase.
- Criteria lists can be provided, but country- and area-specific circumstances will influence the chosen set of criteria.
- Indicators should be globally harmonized to the maximum extent possible, in order to be able to compare project performance.

### 3.2 Recommendations concerning social and economic issues

- For the planning and implementation stage project participants need to identify the interests of the social groups involved as well as the key social issues. Project participants should be able to actively influence the dynamics between these issues, in order to be able to optimally promote the project.
- Social issues have a qualitative as well as a quantitative component. Project target definitions should include both components. At the planning stage project participants should define their goals in a qualitative as well as in a quantitative way.
- Forest mitigation projects must be in line with national/regional policies and national institutional arrangements. At the planning stage project participants should correspond to the national institutional arrangements as well as the national data requirements.

### 3.3 Recommendations concerning environmental issues

An important point of attention is that not only carbon sequestered in biomass should be taken into account. Afforestation can under certain circumstances lead to increased GHG emission (e.g. decrease of the soil carbon pool by drainage of peatland, increase of $N_2O$ emission by intensive fertilization).

For the *action path*:

- With regard to the regional ecosystem as a part of the biosphere on a certain geographical area, all environmental issues should be consistent with existing integrated territorial schemes (in Europe, for example, with state environmental documents of rural landscape management), and all six issues mentioned should be adopted in the project management plan.
- An information system should be created, used and updated, integrating inventory, monitoring, mapping, etc. of all environmental data concerning the project area.
- Guidelines for good environmental practice must be developed and/or adopted.

- Environmental risk and uncertainty analysis must be integrated into the management plan.

For the *control path:*

- The evaluation tools to be used for monitoring must be flexible and can be dependent on experience and data availability.

- Assessment tools should be standardized.

- The functional unit of the environmental assessment should be unified (e.g. 1 tonne of $CO_2$ emission reduction; Muys et al. 2003).

- Evaluation tools should use a set of indicators that cover all five principles for environmental impact assessments.

- Indicators should preferably fulfill the following conditions:

  - Being cost effective and simple in measuring;

  - Being universally applicable (rule for assessment, recommendation for monitoring);

  - Being quantitative rather than qualitative;

  - Being spatially explicit;

  - Not being arbitrarily chosen, but instead based on a solid ecological concept. We propose to choose indicators compatible with the ecosystem exergy concept, as suggested by the working group on land use impact assessment of COST E9 (Life Cycle Assessment for forestry and forest products; cf. Muys and Garcia 2002);

  - Measuring as much as possible at the endpoint (measuring preferably effects instead of impacts);

  - Being low in number;

  - Integrating the time aspect;

  - Distinguishing reversible from irreversible impacts.

### 3.4 Recommendations concerning the institutional dimension

- Countries need to define institutional strategies to achieve the UNFCCC objectives. Strategies facing this institutional challenge deal with institutional capacity building, and are aimed at defining institutional agreements that make it possible to create common task forces or coordination offices for climate change. These could treat the whole climate change theme in a coordinated way and be responsible for reporting at different occasions and to different other institutions.

- The institutional capacity building is strongly related to necessary changes in the legal framework of a country. Therefore, it is necessary again to consider equity and land tenure and land use rights as further central institutional aspects of LULUCF. From this point of view, countries should in turn check their legal framework against the possibility to diminish or jeopardize existing mitigation potentials due to inappropriate laws. Another crucial point is the resistance of existing institutions against change and the time required to establish new, fully operational institutions.

- Institutional legal arrangements within the project should be transparent and should support participation and equity goals. In this sense responsibilities and benefit and burden sharing procedures should be agreed upon according to the project targets.

- Project progress should be reported on a regular basis and also contain an evaluation of the performance of the project and the management of the financial resources involved.

## 4 Summary and conclusion

In this article we have introduced a comprehensive conceptual framework for the assessment of LULUCF projects according to sustainability issues and indicators. Requirements for useful indicators were provided as well as examples of indicators that ought to be included in such assessments. Additional research is needed to develop the proposed framework further in direction of translating the issues into principles, criteria and indicators at the national and/or international level, and to guide the application of the framework in practical work.

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