UN-REDD
PROGRAMME

Potential links between monitoring for multiple benefits of REDD+ and the monitoring requirements of the Rio Conventions

UN-REDD PROGRAMME

18 October 2010

Multiple Benefits Series **9**

The UN-REDD Programme, a collaborative partnership between FAO, UNDP and UNEP, was created in response to, and in support of, the UNFCCC decision on REDD at COP 13 and the Bali Action Plan. The Programme supports countries to develop capacity to reduce emissions from deforestation and forest degradation and to implement a future REDD mechanism in a post-2012 climate regime. It builds on the convening power of its participating UN agencies, their diverse expertise and vast networks, and "delivers as One UN".

The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the biodiversity assessment and policy implementation arm of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organization. The centre has been in operation since 1989, combining scientific research with practical policy advice.

The United Nations has proclaimed 2010 to be the International Year of Biodiversity. People all over the world are working to safeguard this irreplaceable natural wealth and reduce biodiversity loss. This is vital for current and future human wellbeing. We need to do more. Now is the time to act.

Prepared by

Cordula Epple, Nathalie Doswald, Barney Dickson

Copyright: UN-REDD Programme

Copyright release: Reproduction of this publication for educational or other non-commercial purposes is authorised without prior permission from the copyright holders. Reproduction for resale or other commercial purpose is prohibited without the prior written permission of the copyright holders.

Disclaimer: The Multiple Benefits Series provides a forum for the rapid release of information and analysis. Should readers wish to comment on this document, they are encouraged to get in touch via ccb@unep-wcmc.org.

The contents of this report do not necessarily reflect the views or policies of UN-REDD, UNEP-WCMC or contributory organisations. The designations employed and the presentations do not imply the expressions of any opinion whatsoever on the part of UNEP-WCMC or contributory organisations concerning the legal status of any country, territory, city or area or its authority, or concerning the delimitation of its frontiers or boundaries.

Citation: Epple, C., Doswald, N., Dickson, B. 2010. Potential links between monitoring for multiple benefits of REDD+ and the monitoring requirements of the Rio Conventions. *Multiple Benefits Series* **9**. Prepared on behalf of the UN-REDD Programme. UNEP World Conservation Monitoring Centre, Cambridge.

Acknowledgements With thanks to Lera Miles, Peter Herkenrath, Luca Perez (UNEP-WCMC) and Mohamed Bakarr (GEF) for input and comments during the review of the manuscript.

UNEP WCMC

FAO FIAT PANIS UNDP UNEP

2010

Summary

Negotiations are currently ongoing under the United Nations Framework Convention on Climate Change (UNFCCC) about a possible mechanism to provide incentives for measures to reduce emissions from deforestation and forest degradation, and for conservation, sustainable management of forests and enhancement of forest carbon stocks, in developing countries (REDD+).

Many countries are interested in ensuring that the activities undertaken under such a mechanism will avoid negative environmental and social impacts and provide additional benefits, such as maintaining and enhancing biodiversity and ecosystem services. In order to assess whether this aim is being achieved, some form of monitoring will be needed.

At the present state of negotiations, it is not yet clear whether the establishment of a monitoring system for these multiple benefits will become a formal requirement under a REDD+ mechanism, or whether it will remain up to countries to decide whether and how to address this need.

A monitoring scheme for the multiple benefits of REDD+ activities should provide information on the status and trends of multiple benefits and information that can be used to estimate the degree to which any observed changes are attributable to REDD+, as well as the share which is caused by other factors.

For reasons of efficiency, it is desirable that such monitoring schemes build upon existing efforts as far as possible. This paper investigates how efforts to set up monitoring and indicator systems for the multiple benefits of REDD+ can benefit from and/or support the relevant work that has already been initiated or completed under the Rio Conventions.

The analysis shows that there is a significant amount of overlap between the subjects addressed by existing or emerging monitoring activities under the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD) and the UNFCCC, and the types of data that countries might wish to obtain in order to track the multiple benefits of REDD+. At the same time, due to the differences in mandate and focus of the various processes, there are also discrepancies with regard to the design of indicators and methods for data collection.

However, there is still clearly a high potential for mutual support between current work on monitoring under the Rio Conventions and any new schemes to be set up within the context of REDD+. These opportunities should be used to enable a more efficient and coherent implementation of multilateral environmental agreements.

Les liens potentiels entre le monitoring pour les bénéfices multiples de REDD+ et le monitoring requis pour les Conventions de Rio : Résumé

Des négociations sont en cours sous le Convention cadre des Nations unies sur les changements climatiques (CCNUCC) sur un mécanisme éventuel qui fournirait des incitations pour réduire les émissions du déboisement et de la dégradation des forêts, et pour la préservation, la gestion durables des forêts, et le renforcement des stocks de carbone forestiers, dans les pays en développement (REDD+).

Plusieurs pays sont intéressés à assurer que les activités entreprises sous un tel mécanisme évitent des impacts environnementaux et sociaux négatifs et fournissent des bénéfices additionnels, tel que le maintien et le renforcement de la biodiversité et des services écosystémiques. Pour évaluer si ces objectifs sont atteints, une certaine forme de surveillance sera nécessaire.

A présent, il n'est pas clair si l'établissement d'un système de surveillance pour ces benefices multiples sera une exigence formelle sous un mécanisme REDD+, ou si cela restera une décision des pays s'il faut, et comment, aborder cette nécessité.

Un régime de monitoring pour les bénéfices multiples des activités de REDD+ devrait fournir des informations sur l'état et les tendances des bénéfices multiples et des informations qui pourraient être utilisées pour estimer la mesure dans laquelle les changements sont attribuables à REDD+, ainsi qu'au part causé par d'autres facteurs.

Pour des raisons de rendement, il est désirable qu'un tel régime de monitoring soit établit sur des régimes existants dans la mesure du possible. Ce rapport examine comment les efforts entrepris pour établir un system d'indices et de monitoring pour les bénéfices multiples de REDD+ peuvent bénéficier de et soutenir le travail qui a déjà été commencé ou complété sous les Conventions de Rio.

Cet analyse montre qu'il y a un certain degré de chevauchement entre les sujets abordés par les activités de monitoring existantes ou émergeantes sous la Convention sur la diversité biologique (CDB), la Convention des Nations unies sur la lutte contre la désertification (UNCCD), et le CCNUCC, et les genres de données que les pays pourraient vouloir acquérir pour surveiller les bénéfices de REDD+. En même temps, à cause des différences de mandat et d'intérêt, il y a aussi des divergences par rapport à la conception d'indices et de méthodes pour collecter les données.

Cependant, il y a encore un fort potentiel pour un soutien mutuel entre les travaux en cours sur le monitoring pour les Conventions de Rio et n'importe quel régime établit dans le contexte de REDD+. Ces opportunités devraient être utilisées pour permettre une application plus cohérente et efficace des accords environnementaux multilatéraux.

Potenciales enlaces entre el monitoreo de los beneficios múltiples de REDD+ y los requisitos de monitoreo de las Convenciones de Río : Resumen

Actualmente se están llevando a cabo negociaciones bajo la Convención Marco de las Naciones Unidas sobre el Cambio Climático (CMNUCC) referentes a un posible mecanismo para incentivar medidas para la reducción de emisiones derivadas de la deforestación y la degradación forestal y para la conservación, la gestión sostenible de los bosques y el aumento de las reservas forestales de carbono en los países en vías de desarrollo (REDD+).

Muchos países están interesados en asegurar que las actividades llevadas a cabo bajo tal mecanismo eviten impactos ambientales y sociales negativos y que proporcionen beneficios adicionales, tales como el mantenimiento y la mejora de la biodiversidad y de los servicios ambientales. Para evaluar si se consigue este objetivo, será necesario llevar acabo algún tipo de monitoreo.

En el punto actual de las negociaciones, aun no está claro si el establecimiento de un sistema de monitoreo para estos beneficios múltiples será un requisito formal bajo un mecanismo de REDD+ o si continuarán siendo los países los que decidan si abordar esta necesidad y cómo hacerlo.

Un programa de monitoreo para los beneficios múltiples de las actividades de REDD+ debería proporcionar información sobre la situación y las tendencias de los beneficios múltiples e información que puede ser utilizada para estimar el grado en el que los cambios observados se pueden atribuir a REDD+, además de la proporción causada por otros factores.

Por razones de eficiencia, es deseable que tales programas de monitoreo se basen en esfuerzos existentes en la medida de los posible. Este documento investiga cómo los esfuerzos para poner en marcha sistemas de monitoreo y de indicadores para los beneficios múltiples de REDD+ se pueden beneficiar de y/o apoyar el trabajo relevante que ya se ha iniciado o completado bajo las Convenciones de Río.

El análisis muestra que existe una superposición significativa entre los temas abordados por las actividades de monitoreo existentes o emergentes del Convenio sobre la Diversidad Biológica (CDB), la Convención de las Naciones Unidas de Lucha contra la Desertificación (CNULD) y la CMNUCC, y los tipos de datos que los países podrían desear obtener para hacer un seguimiento de los beneficios múltiples de REDD+. Al mismo tiempo, debido a las diferencias en los mandatos y los enfoques de los distintos procesos, hay también discrepancias en lo referente al diseño de indicadores y métodos para la recogida de datos.

Sin embargo, existe claramente un gran potencial de apoyo mutuo entre el trabajo actual de monitoreo bajo las Convenciones de Río y cualquier nuevo programa que se establezca dentro del contexto de REDD+. Estas oportunidades se deberían usar para permitir una implementación más eficiente y coherente de los acuerdos ambientales multilaterales.

Potensi keterkaitan antara monitoring untuk multi-manfaat REDD+ dan persyaratan-persyaratan monitoring dari Konvensi Rio : Ringkasan

Negosiasi-negosiasi yang berlangsung saat ini di Konvensi Kerangka Kerja PBB tentang Perubahan Iklim (UNFCCC) membahas tentang suatu mekanisme yang memungkinkan untuk menyediakan insentif bagi upaya-upaya pengurangan emisi dari deforestasi dan degradasi hutan, dan juga untuk konservasi, pengelolaan hutan yang berkelanjutan serta peningkatan cadangan karbon hutan, di negara-negara berkembang (REDD+).

Banyak negara-negara yang ingin memastikan bahwa aktifitas-aktifitas yang dilakukan di bawah mekanisme seperti itu akan dapat menghindari dampak lingkungan dan dampak sosial yang negatif serta dapat memberikan manfaat-manfaat tambahan, seperti misalnya mempertahankan dan meningkatkan keanekaragaman hayati dan jasa-jasa ekosistem. Dalam upayanya untuk mengkaji apakah tujuan tersebut tercapai atau tidak, akan diperlukan beberapa bentuk monitoring tertentu.

Dalam negosiasi-negosiasi yang sedang berlangsung saat ini, belum jelas apakah pengembangan sistem monitoring untuk multi-manfaat tersebut akan menjadi suatu persyaratan formal dalam mekanisme REDD+, atau apakah hal ini akan tetap bergantung kepada negara-negara untuk memutuskan apa dan bagaimana menangani kebutuhan akan hal tersebut.

Suatu skema monitoring untuk multi-manfaat dari aktifitas-aktifitas REDD+ harus mampu menyediakan informasi tentang status dan tren dari multi-manfaat itu sendiri, dan juga informasi yang dapat digunakan untuk memperkirakan sampai sejauh mana perubahan-perubahan yang telah diamati tersebut dapat dianggap berasal dari REDD+, sebagaimana halnya dengan yang ditimbulkan oleh faktor-faktor lain.

Untuk alasan-alasan efisiensi, akan lebih baik jika skema- skema monitoring seperti ini sebisa mungkin dibangun atas dasar upaya-upaya yang telah ada saat ini. Paper ini meneliti tentang bagaimana upaya-upaya di dalam menyusun sistem monitoring dan indikator multi-manfaat

REDD+ dapat mengambil keutungan dari dan/atau mendukung kegiatan yang relevan yang telah di-inisiasi atau diselesaikan pada Konvensi Rio.

Analisis tersebut menunjukkan bahwa begitu banyak tumpang tindih yang terjadi diantara subyek-subyek yang menjadi bagian dari aktifitas monitoring saat ini pada Konvensi Keanekaragaman Hayati (Convention on Biological Diversity /CBD), Konvensi PBB untuk Penanggulangan Penggurunan (United Nations Convention to Combat Desertification/UNCCD) dan UNFCCC, dan diantara berbagai jenis data yang akan dibutuhkan oleh negara-negara di dalam upayanya untuk menelusuri multi-manfaat dari REDD+. Pada saat yang sama, dikarenakan adanya perbedaan pada mandat dan fokus dari berbagai proses yang beragam, maka timbul pula perbedaan- perbedaan yang terkait dengan desain dari indikator dan metode-metode untuk pengumpulan data.

Namun demikian, jelas terlihat adanya potensi yang tinggi untuk bisa saling mendukung diantara kegiatan monitoring yang berlangsung saat ini di bawah Konvensi Rio dengan setiap skema monitoring manapun yang akan dikembangkan di dalam konteks REDD+. Peluang-peluang seperti ini harus dimanfaatkan dengan baik untuk memudahkan bagi pelaksanaan kesepakatan-kesepakatan lingkungan hidup multilateral yang lebih efisien dan konsisten.

Table of contents

1 Introduction

In 2007, the 13th Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) initiated a strand of negotiations on policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (Decision 1/CP.13; UNFCCC 2008). This approach for climate change mitigation based on the carbon sequestration and storage potential of forests is commonly referred to as REDD+.

While climate change mitigation is the primary aim of REDD+, it is likely that a REDD+ mechanism, if successfully implemented, would provide significant additional benefits, especially in terms of gains for biodiversity and ecosystem services. Indeed, many forests in developing countries contain high levels of biodiversity and provide a range of ecosystem services, which could be maintained and enhanced along with carbon stocks. In some instances, however, REDD+ activities might harm ecosystems, for example if they lead to the conversion of natural forest, the displacement of human impacts to other sensitive areas (so called 'leakage') or the planting of monocultures, tree stands including potentially invasive alien species, or tree stands not suited to site conditions because of their impact on soils or water balance. This risk has been recognised in the current negotiating text and addressed through text proposals brought forward by various Parties on safeguards, eligibility criteria and other provisions as to how REDD+ activities should be implemented. The term "safeguard", as used in the proposed language included in the latest version of the negotiating text, covers both measures to prevent harm and measures to enhance the positive effects of activities (FCCC/AWGLCA/2010/14; UNFCCC 2010).

Many countries are interested in promoting these positive effects and ensuring multiple benefits from REDD+, as can be seen from a number of the National Joint Programmes prepared under the UN-REDD programme, or the REDD Readiness Preparation Proposals submitted to the Forest Carbon Partnership Facility (e.g. Manh Cuong et al. 2008; Makonga 2010).

In order to ascertain that measures to promote multiple benefits and/or measures to prevent harm from REDD+ implementation are achieving their aims, and to enable adjustments to management if necessary, some form of monitoring will be required. For reasons of efficiency, such monitoring schemes should be linked to the monitoring of the climate-related performance of REDD+ activities as far as possible (Teobaldelli et al. 2010). They should also make use of opportunities to build upon other existing efforts.

An approach that seems to suggest itself in this context is to look into the possible links between the monitoring and reporting activities that have so far been undertaken within the framework of the three Rio Conventions[1], and monitoring for multiple benefits of REDD+. Many of the ecosystem-derived benefits whose upkeep and enhancement can be an additional target of REDD+ activities, such as biodiversity and ecosystem services, are addressed in a more comprehensive way within the scope of

[1] In addition to the United Nations Framework Convention on Climate Change (UNFCCC), these are the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification Particularly in Africa (UNCCD).

the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). All of the countries eligible to participate in REDD+ activities are also Parties to at least one (in most cases both) of these Conventions and therefore obliged to implement their provisions. Whilst the tasks and mandates of each Convention are different, they share the common goal to promote sustainable development, and can in reality not be implemented in isolation from one another because the ecological and environmental processes and drivers of change that they address are interlinked.

All three Rio Conventions set out reporting requirements for the contracting Parties, and a lot of work has been undertaken to develop indicators that can be used at the national or international level to measure progress towards their objectives and targets. Because of the above-mentioned interlinkages between the issues addressed by the different conventions, there is some overlap between the respective reporting requirements and indicators as well, and options for harmonization or integration have been explored through various projects (UNEP-WCMC 2010).

Against this backdrop, the purpose of the present study is to investigate how efforts to set up monitoring and indicator systems for the multiple benefits of REDD+ can build upon and/or support the relevant work that has already been initiated or completed under the Rio Conventions. The possible linkages between monitoring for multiple benefits and measuring the climate-related performance of REDD+ have been analysed in a previous issue of the Multiple Benefits Series (Teobaldelli et al. 2010) and will be referred to where relevant.

2 Data and indicators needed to measure multiple benefits of REDD+ and their relation with monitoring and reporting activities under the Rio Conventions

To obtain solid and reliable information about how well a REDD+ activity succeeds in achieving multiple benefits, it is necessary both to collect information about the type of activities implemented and the status and trends of the benefits in question, and to determine the impact of other factors which are likely to have an influence on those benefits. For example, if a REDD+ activity has been designed to provide stabilisation of the hydrological regime in a watershed as an additional benefit, it will be important to link the observed hydrological parameters to climatic data and information about other land use activities in the watershed before any conclusions are drawn about the positive or negative impacts of REDD+.

Where the impact of anthropogenic pressures on the provision of multiple benefits from an ecosystem is well known, monitoring the status and trends of pressures (such as pollution or fragmentation) as well as of the benefits themselves can have the added value of allowing early detection of positive or negative developments, thus facilitating timely adjustments in management if necessary (Teobaldelli et al. 2010).

Because of the complexity of the ecological and socio-economic processes involved, it will often not be possible to measure all relevant factors in the cause-and-effect relationship directly. Instead, appropriate indicators will have to be used. Indicators are information tools designed to depict the situation or development with regard to a complex issue through a proxy measure in a way that is easy to understand and communicate as well as based on scientific knowledge. They provide an efficient way of monitoring and communicating environmental conditions, results of policy decisions and management activities (Niemeijer 2002).

Simple indicators can be measured directly by choosing them as monitoring parameters (e.g. the population trends of one or several indicator species can be measured and used as an indication of the overall trend of biodiversity in an area or ecosystem), while more complex indicators are calculated from the combined values of several monitoring parameters according to a set formula (e.g. the Human Footprint index is derived from several parameters related to human impacts on ecosystems, and can be used as a summary indication of the degree of anthropogenic pressure in an area).

The following section of this chapter discusses the current UNFCCC negotiating text on REDD+ (FCCC/AWGLCA/2010/14; UNFCCC 2010) to derive the possible characteristics of a future REDD+ regime that would be relevant to determining appropriate monitoring frameworks for multiple benefits. It also mentions some of the approaches used to monitoring of multiple benefits in REDD+ pilot projects. The chapter then refers to the reporting requirements, targets and indicators of the three Rio Conventions that may provide a basis for the collection of data that can also be used for monitoring multiple benefits and safeguards in REDD+. The aim of this chapter is to explore the potential points of contact between the monitoring activities inspired by the different processes. As the potential outcome of negotiations on the subject of REDD+ is still entirely open, care has been taken not to draw any premature conclusions on the basis of framework conditions that may be subject to change.

2.1 The state of UNFCCC negotiations on REDD+ and current practice approaches on measuring multiple benefits of forest-based mitigation measures

The current UNFCCC negotiating text on long-term cooperative action under the Convention (FCCC/AWGLCA/2010/14; UNFCCC 2010) contains a number of proposed provisions concerning the achievement of multiple benefits from REDD+ activities and the prevention of environmental damage.

For example, it has been suggested that the Conference of the Parties (COP) should affirm "that the implementation of activities (...) [Be consistent with the principle of environmental integrity]"[2], that it "Be consistent with the adaptation needs of the country"[3] and that it "[Promote sustainable management of forests]"[4].

Suggestions have also been made to the effect that "[Eligibility criteria for funding forest related activities should include the following: (...) Proposals shall not be considered that allow industrial scale

[2] Option 1, para. 1 (c) bis
[3] Option 1, para 1 (h)
[4] Option 1, para 1 (l)

logging or that involve conversion of natural forests to plantations or other commercial or infrastructure activities and projects that damage the environment or violate the rights of local communities"[5].

Finally, it has been proposed that the COP should further affirm "that when undertaking activities (...) the following safeguards should be [promoted and supported] [ensured]: (...) [Actions that are consistent with the conservation of natural forests and biological diversity, ensuring that actions (...) are not used for the conversion of natural forests [into plantations, as monoculture plantations are not forest], but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits;[6] (...)]"

With regard to the framework conditions for implementation, the negotiating text contains draft language suggesting that the COP should request developing Parties who would like to become involved in REDD+ activities to "develop (...) [A robust and transparent national forest monitoring system [for the monitoring and reporting] of the activities (...) [, and the safeguards referred to in paragraph 2 above][7]".

Depending on whether or not this or a similar provision is finally approved by the COP, monitoring related to the impacts of REDD+ on natural forests, biodiversity and ecosystem services, and other social and environmental benefits, may thus either become a formally required part of the mechanism, in which case it is likely that further operational guidance to Parties would be developed at a later stage, or remain a task to be shaped by countries at their discretion.

As can also be seen from the above quotes, although both the promotion of multiple benefits from REDD+ activities and the prevention of environmental damage are repeatedly mentioned in the draft text, the proposals are non-specific when it comes to identifying the ecosystem services and other benefits that should be enhanced and the risks that should be avoided, with the possible exception of the suggested provisions to contribute to the conservation of natural forests and biological diversity and to avoid the conversion of natural forests and industrial scale logging activities.

It thus seems likely that, regardless of whether such efforts will be driven by explicit UNFCCC commitments or by national interest, a significant part of the work to determine appropriate goals, monitoring schemes and indicators for the achievement of multiple benefits and the prevention of harm from REDD+ activities will remain to be done at the national level, taking into account those ecosystem-derived benefits and risks of harm that are most relevant under the conditions of the individual country, and the synergies and trade-offs that may arise between different ecosystem services.

In order to decide on suitable goals and targets against which to evaluate the information obtained from monitoring, reference levels or baselines will need to be defined at the national level. This exercise can be carried out in an integrated manner for both the mitigation effects and other ecosystem-derived benefits of REDD+. However, depending on the scale at which benefits are delivered (which can range from local to global), the goals and targets for multiple benefits may need to be more spatially explicit

[5] Option 1, para 1 bis (c)
[6] Option 1, para 2 (e)
[7] Option 1, para 5 (c)

than those for climate change mitigation. There may also be particular challenges in the case of less-well researched ecosystem services, when the precise nature of their relation to the state of the forest (and other) ecosystems is insufficiently known (Teobaldelli et al. 2010).

In spite of these uncertainties, some general assumptions can be made about the information requirements that would arise with most monitoring schemes. It is likely that obtaining the following broad types of data would be desirable (see Box 1 for more specific examples of data that could be of interest in each category):

a) Data related to the status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits.

   For a discussion of the challenges involved in identifying appropriate monitoring parameters and indicators to reflect the status and trends of the different kinds of multiple benefits, see Teobaldelli et al. (2010).

b) Data related to the status and trends of anthropogenic pressures known to have an influence on the status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits.

   As explained above, such pressure-related indicators can add value to the direct monitoring of status and trends of the benefits that are of interest by providing early warning of processes that are likely to affect those benefits. However, the causal relationships between pressures and states need to be strong and well-researched in order to allow meaningful interpretation. Observing the correlation between the development of pressure and state indicators over a longer time period as monitoring schemes are implemented can help to check the validity of the assumptions made.

c) Data which can be used to estimate the degree of changes in the status of natural forests, biodiversity and ecosystem services, other social and environmental benefits, and anthropogenic pressures on these, that is attributable to REDD+ activities, and the share which is caused by other factors.

   Expected trends in the relevant external factors of influence should be taken into account when developing REDD+ strategies and measures, and the success of REDD+ implementation regarding both climate change mitigation and other multiple benefits will be assessed against the baselines that have been set prior to the start of activities. However, data on actually observed trends and events regarding these factors will be crucial in order to inform any necessary adaptation of REDD+ strategies. Depending on the rules that will be agreed for REDD+ crediting, they might also under certain circumstances be used by countries to argue a case of *force majeure*, i.e. to request an ex-post adjustment of their baseline on the grounds of unforeseeable events or circumstances that were beyond their control and had a significant negative impact on their ability to meet the agreed targets.

Box 1: Examples of data needs that could be addressed in schemes for monitoring the multiple benefits of REDD+ activities

a) Data related to the status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits:

- (change of) area covered by primary forest, secondary forest and plantations,
- (change of) area covered by different types of forest ecosystems,
- (change of) area covered by non-forest ecosystems of high biodiversity value,
- (change of) conservation status of areas classified as priority areas for conservation (e.g. protected areas, known biodiversity hotspots etc.),
- (change of) conservation status of forest and non-forest species that have been selected as biodiversity indicators,
- (change of) area with certain ecosystem qualities that have been selected as biodiversity indicators particularly in areas undergoing some form of management (e.g. degree of structural diversity, crown cover, amount of dead wood),
- (change of) availability of sustainable flows of those ecosystem services that are considered relevant in the national or regional context, for example:
  - clean water (provision to be assessed by quantity and quality, and taking into account the temporal relationship between highest availability and demand),
  - flood protection,
  - erosion control,
  - prevention of damage from human-induced fires (this service could be influenced by activities such as the re-wetting of peatlands),
  - timber,
  - non-timber forest products (food, fuel, fibres, medicines, etc.),
  - forest genetic resources,
  - attractions relevant for tourism (populations of charismatic species, intactness and naturalness of ecosystems, etc.),
  - cultural and spiritual values,
- (change of) financial, livelihood security and other benefit flows (such as security of land tenure, empowerment, conflict resolution, capacity-building) generated as a consequence of REDD+ activities to local communities.

b) Data related to the status and trends of anthropogenic pressures known to have an influence on the status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits:

- (change in) forest area subjected to non-sustainable land use practices or other human activities that are expected to lead to degradation in the long run (e.g. drainage affecting the hydrological balance of peat forests, clearcuts in erosion-prone forest areas, overharvesting of forest resources, road and other infrastructure development),
- (change in) occurrence of invasive alien species as a consequence of human activity (e.g. use of invasive alien species in afforestation),
- (change in) fragmentation of natural areas,
- (change in) incidence of human-induced fires.

c) Data which can be used to estimate the degree of changes in the status of natural forests, biodiversity and ecosystem services, other social and environmental benefits, and anthropogenic pressures on these, that is attributable to REDD+ activities, and the share which is caused by other factors:

- type, extent, location and direct results of REDD+ activities carried out (e.g. declaration of new protected areas or strengthening of existing ones, improvements to management of production forests, afforestation activities – this information may also be needed to demonstrate compliance with any direct requirements that may be adopted concerning the types of activities that can be supported under REDD+, such as exclusion of conversion of natural forest into plantations),
- information from available scenarios and baselines describing the projected development of land use and other anthropogenic drivers of change and their effects on biodiversity and ecosystem services under 'business as usual' conditions,
- observed development of land use and other anthropogenic drivers of change which have not been targeted by REDD+ activities (and are thus not addressed under the first bullet point),
- occurrence of extreme events which have impacts on biodiversity and ecosystem services, such as pest outbreaks, large-scale fires, or extreme weather events,
- changes in climate.

All three types of data should ideally be collected separately for the areas directly affected by REDD+ activities and for the whole of the country in order to facilitate comparisons between indicator trends in REDD+ areas and in areas without measures. Defining the area where a measure takes effect will be more straightforward for some kinds of activities than for others. For example, in certain national settings a change in the management of state-owned forest companies may be implemented on a clearly defined expanse of land, while the abolition of subsidies that provide an incentive to forest conversion by private stakeholders may potentially have effects throughout all of the country's forested regions.

This kind of spatial disaggregation of data will also allow the detection of indirect effects on biodiversity and ecosystem services caused by displacement of land use or other human activities from REDD+ areas to other areas (so-called leakage). The concept of leakage has been widely discussed in the context of greenhouse gas emissions being shifted to new locations, and it applies in the same way to other environmental (and social) impacts associated with the displaced activities.

The detection of leakage effects represents a particular challenge, as has been noted by many authors. At the current state of negotiations under the UNFCCC, it is not yet clear whether addressing issues of leakage with regard to multiple benefits will be included as a monitoring requirement, or whether this will be left at the discretion of countries. There is, however, suggested language to the effect that monitoring and reporting of emissions displacement should be required at the national level[8]. Assessing the displacement of emissions would necessitate an analysis of shifts in land use resulting from REDD+ implementation and would thus provide a good starting point for assessing effects on multiple benefits as well.

It should be noted that the data requirements outlined above and in Box 1 are indicative and provided only as a basis to allow discussion of the possible overlaps, synergies and discrepancies with other monitoring activities under the Rio Conventions. In practice, the applicability, relevance and relative importance of each of the mentioned fields of information will differ from country to country.

In the absence of a concluding agreement on a future REDD+ mechanism, further ideas on the forms that monitoring for multiple benefits could take can be gathered from the monitoring protocols that have been developed within the framework of REDD+ demonstration projects, forest carbon projects certified under voluntary standards, and countries' plans and programmes to prepare for participation in a future REDD mechanism, such as the Readiness Preparation Proposals developed with support from the Forest Carbon Partnership Facility (see Box 2).

[8] Option 1, para 5 (c), footnote

Box 2: Examples of monitoring approaches used in existing REDD (+) initiatives and forest carbon projects

Biodiversity parameters: Change in area of selected habitat types, change in species numbers and composition in repeated samples, change in abundance and distribution of indicator species, forest fragmentation indices.
Data collection methods: Remote sensing, field observations (transect counts, vegetation surveys, camera trapping, etc.), community-based rapid appraisal, trade monitoring.

Parameters related to water regulation services: Climate data, data on extreme flow levels, data on water levels during dry season, data on water quality.
Data collection methods: Automatic data recording at weather stations, water level gauges, field measurements.

Parameters related to erosion control services: Data on soil infiltration rates, surface soil erosion and soil sedimentation rates.
Data collection methods: Measurements on permanent plots, sediment traps.

Parameters related to socio-economic benefits to communities: Total community income from direct use of forest resources, family income from cash incentives for participation in project activities, annual work hours of local community personnel employed by project (to be measured against without project scenario), No. of participants trained in forest establishment and management techniques, No. of households with improved tenurial status.
Data collection methods: Household surveys, project records.

Sources: http://www.forestcarbonpartnership.org, http://www.climate-standards.org/projects/, websites of individual projects

2.2 CBD provisions on monitoring and indicators

Article 7 of the Convention on Biological Diversity (CBD) requests Parties ("as far as possible and as appropriate") to:

(a) Identify components of biological diversity important for its conservation and sustainable use having regard to the indicative list of categories set down in Annex I of the Convention[9];

[9] These categories are: 1. Ecosystems and habitats: containing high diversity, large numbers of endemic or threatened species, or wilderness; required by migratory species; of social, economic, cultural or scientific importance; or, which are representative, unique or associated with key evolutionary or other biological processes; 2. Species and communities which are: threatened; wild relatives of domesticated or cultivated species; of medicinal, agricultural or other economic value; or social, scientific or cultural importance; or importance for research into the conservation and sustainable use of biological diversity, such as indicator species; and 3. Described genomes and genes of social, scientific or economic importance.

(b) Monitor, through sampling and other techniques, the components of biological diversity identified pursuant to subparagraph (a) above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;

(c) Identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity, and monitor their effects through sampling and other techniques; and

(d) Maintain and organize, by any mechanism data, derived from identification and monitoring activities pursuant to subparagraphs (a), (b) and (c) above.

The request to ensure availability of a mechanism by which to maintain and organize data is of particular relevance when considering synergies between the monitoring activities prompted by different environmental agreements and processes, since it could be expected that such a system, if fully operational, would provide a central repository for biodiversity-relevant information from various sources.

However, the provisions of CBD Article 7 are expressed in a non-binding manner, and Parties are in different stages of progress. Efforts on monitoring are often linked to the development and implementation of National Biodiversity Strategies and Action Plans, which to date have been finalized by 171 Parties (89 per cent of the total) (UNEP/CBD/COP/10/8, CBD 2010a).

Further guidance on particular issues that should be addressed through monitoring programmes has been provided by the Conference of the Parties in a number of decisions, such as the Programmes of Work on Agricultural Biodiversity (Dec. 3/11), Forest Biological Diversity (Dec. 6/22) and Protected Areas (Dec. 7/28).

According to the National Reports Analyzer Tool available on the Convention's website[10] and based on information provided by Parties in their Third National Reports to the CBD[11], at the time of submission about 75% of the reporting Parties had some form of monitoring programmes in place at the level of ecosystems, more than 80% reported monitoring programmes at species level, and about 45% were undertaking some form of systematic monitoring related to genetic biodiversity.

Concerning key threats to biodiversity, issues related to invasive alien species and threats resulting from climate change were being monitored by more than half of the Parties submitting reports, and overexploitation or unsustainable use, land use change/land degradation and pollution/eutrophication by about two thirds. Only little more than 10% of Parties replied that they were not undertaking any monitoring related to threats at all.

[10] http://www.cbd.int/reports/analyzer.shtml

[11] Third National Reports were due for submission on 15 May 2005. 123 reports submitted by Parties were available for use in the analysis. Information from Fourth National Reports is currently not accessible through the Reports Analyzer Tool.

As to the state of establishment of mechanisms for information collection and management, about 20% of Parties stated that such a mechanism was non-existent or under consideration only; about 45% each stated that a mechanism was currently being established or already in place, and about 10% added that their data management system was seen as relatively complete (note that multiple ticking was possible on this question which is why the figures add up to more than 100%).

The choice of monitoring methods, parameters and indicators by which to fulfill the provisions of Article 7 and to measure the success in meeting the goals and targets of National Biodiversity Strategies and Action Plans is up to Parties, resulting in a wide range of approaches and degrees of coverage.

However, a global framework has been developed as part of the efforts to measure progress towards the 2010 Biodiversity Target, which was adopted by the 6th Conference of the Parties to the CBD in 2002 as part of its Strategic Plan for the period of 2002-2010 (Decision VI/26), and which required Parties to work together "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional, and national level". This target was later supplemented by a set of goals and sub-targets aiming to add clarification and facilitate the assessment of progress (Decision VII/30, see Box 3).

A framework of indicators (the so-called CBD Headline Indicators) was developed for measuring progress towards the 2010 Biodiversity target and the set of goals and sub-targets, and has been applied at global scale (Butchart et al. 2010; SCBD 2010). Parties were also invited to use the goals and sub-targets as a framework when developing national and/or regional targets for their implementation of the Convention, and to use or develop appropriate indicators related to them (Decision VII/30).

This request has been acted upon by Parties in different ways, and a review of the available 3rd and 4th National Reports to the CBD suggests that national indicators have been widely adopted using the CBD framework as a guide, but designed to fit the specific context of the individual country. According to the 4th National Reports, countries are still at different stages in terms of indicator development, with 21% not (yet) in the process of developing national biodiversity indicators (UNEP/CBD/SBSTTA/14/INF/14, CBD 2010b).

The main challenges faced especially by developing countries were lack of capacity, lack of institutional responsibility and accountability for biodiversity monitoring, data management and ownership issues, lack of consistent trend data, absence of ecological baselines and insufficient knowledge of ecosystem processes (UNEP-WCMC 2009).

Box 3: Elements of the set of goals and sub-targets to the 2010 Biodiversity Target (Dec. VII/30) that interlink with the achievement of multiple benefits from REDD+

Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes

Target 1.1: At least 10% of each of the world's ecological regions effectively conserved

Target 1.2: Areas of particular importance to biodiversity protected

Goal 2. Promote the conservation of species diversity

Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups

Target 2.2: Status of threatened species improved

Goal 3. Promote the conservation of genetic diversity

Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained

Goal 4. Promote sustainable use and consumption

Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and Production areas managed consistent with the conservation of biodiversity

Target 4.2: Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced

Target 4.3: No species of wild flora or fauna endangered by international trade

Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced

Target 5.1: Rate of loss and degradation of natural habitats decreased

Goal 6. Control threats from invasive alien species

Target 6.1: Pathways for major potential alien invasive species controlled

Target 6.2: Management plans in place for major alien species that threaten ecosystems, habitats or species

Goal 7. Address challenges to biodiversity from climate change, and pollution

Target 7.1: Maintain and enhance resilience of the components of biodiversity to adapt to climate change

Target 7.2: Reduce pollution and its impacts on biodiversity

Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Target 8.1: Capacity of ecosystems to deliver goods and services maintained

Target 8.2: biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained

Goal 9 Maintain socio-cultural diversity of indigenous and local communities

Target 9.1 Protect traditional knowledge, innovations and practices

Target 9.2: Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing

(...)

A new CBD Strategic Plan for the period 2011-2020 is currently being developed, and the background document prepared by the Executive Secretary to inform negotiations at the 10th Conference of the Parties[12] contains a table listing the latest version of the suggested goals and targets (see Box 4) and related milestones as well as possible indicators. The table includes the existing CBD Headline Indicators as well as a number of proposed new indicators that would need further development.

A significant share of the work outlined above could be of relevance to the monitoring of multiple benefits and safeguards under a REDD+ mechanism. Table 1 (see Annex) gives an overview of how the different monitoring requirements and existing and proposed indicators developed under the CBD relate to the indicative data needs for measuring multiple benefits of REDD+ activities that have been described in section 2.1.

[12] Revised and updated strategic plan: technical rationale and suggested milestones and indicators (UNEP/CBD/COP/10/9)

Box 4: Elements of the proposed goals and targets for the CBD's Strategic Plan 2011-2020 (Doc. UNEP/CBD/COP/10/9) that interlink with the achievement of multiple benefits from REDD+

Strategic goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

(...)

Target 3: By 2020, at the latest, incentives[, including subsidies,] harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts [and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, [consistent with relevant international obligations]] , taking into account national socio-economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic goal B. Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss and degradation, and fragmentation, of natural habitats, [including forests], is [at least halved][brought close to zero].

(...)

Target 7: By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species are identified, prioritized and controlled or eradicated and measures are in place to control pathways for the introduction and establishment of invasive alien species.

(...)

Strategic goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least [15%][20%] of terrestrial, inland water and [X%] of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through comprehensive, ecologically representative and well-connected systems of effectively managed protected areas and other means, and integrated into the wider land- and seascape.

Target 12: By 2020 the extinction and decline of known threatened species has been prevented and improvement in the conservation status [for at least 10% of them] has been achieved.

Target 13: By 2020, the loss of genetic diversity of cultivated plants and domestic farm animals in agricultural ecosystems and of wild relatives is halted and strategies have been developed and implemented for safeguarding the genetic diversity of other priority socio-economically valuable species as well as selected wild species of plants and animals.

Strategic goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Target 14: By 2020 ecosystems that provide essential services and contribute to health, livelihoods and well-being, are safeguarded and/or restored and equitable access to ecosystem services is ensured for all, taking into account the needs of women, indigenous and local communities and the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

(...)

2.3 UNCCD provisions on monitoring and indicators

The text of the United Nations Convention to Combat Desertification contains a number of provisions related to monitoring. Article 10 of the Convention, which lays out the purpose, approach and suggested contents of the National Action Programmes (NAPs) that are to be developed to combat desertification and mitigate the effects of drought, stipulates that such programmes shall, *inter alia*, require regular review of, and progress reports on, their implementation (Art. 10.2 (g)). The suggested contents of the programmes include measures on a number of issues that may also play a role in the context of multiple benefits from REDD+, such as the sustainable management of natural resources, sustainable agricultural practices and the promotion of alternative livelihoods, so the monitoring of these measures is likely to provide information that is relevant to both processes.

Additional guidance on the content of NAPs is provided in the Regional Implementation Annexes of the Convention. Such Annexes exist for Africa, Asia, Latin America and the Caribbean, the Northern Mediterranean and Central and Eastern Europe. Some of them include further specific references to monitoring.

For example, the Regional Implementation Annex for Africa (Annex I) asks Parties, as appropriate, to include in their National Action Programmes *inter alia* measures to improve knowledge of desertification, such as promoting research and the collection, processing and exchange of information on the scientific, technical and socio-economic aspects of desertification; and encouraging the medium- and long-term study of socio-economic and cultural trends in affected areas, qualitative and quantitative trends in natural resources, and the interaction between climate and desertification; and measures to monitor and assess the effects of drought, such as monitoring and assessing ecological degradation to provide reliable and timely information on the process and dynamics of resource degradation in order to facilitate better policy formulations and responses (Annex I, Art. 8.3 (d) and (e)).

Independently from the provisions related to National Action Programmes, in Article 16 of the Convention Parties agree, according to their respective capabilities, to integrate and coordinate the collection, analysis and exchange of relevant short-term and long-term data and information to ensure systematic observation of land degradation in affected areas and to understand better and assess the processes and effects of drought and desertification.

To this end, they shall, as appropriate, carry out *inter alia* the following: facilitate and strengthen the functioning of the global network of institutions and facilities for the collection, analysis and exchange of information, as well as for systematic observation at all levels; support and further develop bilateral and multilateral programmes and projects aimed at defining, conducting, assessing and financing the collection, analysis and exchange of data and information, including, inter alia, integrated sets of physical, biological, social and economic indicators; and give full weight to the collection, analysis and exchange of socioeconomic data, and their integration with physical and biological data.

Since the Convention entered into force in 1996, a sizeable amount of work has been undertaken on desertification-related monitoring, assessment and development of baselines and indicators. Relevant initiatives have been carried out by countries, regional networks (e.g. the Thematic Programme Networks that have been set up in the context of UNCCD Regional Action Programmes), institutions such as the Sahara and Sahel Observatory, ISRIC-World Soil Information, FAO and UNEP, and the bodies of the Convention, as well as within the context of scientific projects (ICCD/COP(8)/CST/2/Add.1; UNCCD 2007).

However, although most countries have developed some form of monitoring and assessment systems, the systems that exist are based on a highly heterogeneous range of different benchmarks and indicators. Also, many of them suffer from a lack of capacity for data collection and processing or have not been fully implemented (Grainger 2009, ICCD/COP(8)/CST/2/Add.1; UNCCD 2007).

In 2007, with the adoption by the Conference of the Parties (COP) of a 10-year strategic plan and framework for 2008-2018 to enhance the implementation of the Convention (ICCD/COP(8)/16/Add.1), the UNCCD has made significant progress towards identifying an agreed global minimum set of appropriate physical, biological and socio-economic indicators to be used by all countries in monitoring the processes and impacts of UNCCD implementation). The Strategic Plan places an increased emphasis on results-based management and outlines four strategic objectives and five operational objectives (see Box 5). Support to national monitoring and vulnerability assessments as well as steps towards a harmonization of approaches to measuring biophysical and socio-economic trends are included among the intended outcomes of the strategy (outcomes 3.1 and 3.2).

In order to measure progress in the implementation of the Strategy, the ninth Conference of the Parties in 2009 introduced the Performance Review and Assessment of Implementation System (PRAIS) which is based on a provisional set of impact indicators to measure progress on the strategic objectives, and of performance indicators for the operational objectives. The two sets of indicators will be subject to a continuous adjustment and refinement in what is termed an "iterative process" based on lessons learnt and feedback from the Parties collected in the different reporting cycles.

Most importantly, it must be noted that the PRAIS framework introduces the obligation for all Parties and reporting entities to regularly report to the COP (every 2 years for the performance indicators and every 4 years for the impact indicators) based on the agreed sets of indicators, methodologies and reporting format. The PRAIS system is also supported by an on-line reporting platform (PRAIS portal) that will be linked to the overall Knowledge Management System of the UNCCD.

In the following analysis, only the set of impact indicators related to the strategic objectives 1-3 will be considered, as this is the most relevant with regard to possible synergies with monitoring for multiple benefits from REDD+ activities. The set consists of 11 measures covering biophysical as well as socio-economic information.

As decided by the COP, two indicators – (1) the proportion of the population in affected areas living above the poverty line, and (2) land cover status – are the minimum subset of impact indicators required for reporting by affected countries during the 5th reporting cycle in 2012. The remaining nine impact indicators, while recommended, were considered optional for inclusion in this round of reports by affected countries and are currently subject to a further process of refinement. (ICCD/COP(9)/18/Add.1 – Decision 13/COP9).

However, in the long run it is envisaged that all Parties will use the full list of indicators and related methodological guidance as a minimum set in fulfilling their monitoring and reporting commitments under the Convention.

Table 2 (see Annex) gives an overview of how the different monitoring requirements and the provisional set of impact indicators developed under the UNCCD relate to the indicative data needs for measuring multiple benefits of REDD+ activities described in section 2.1.

Box 5: Elements of the set of objectives of the UNCCD Strategic Plan 2008-2018 (Dec. 3/COP.8) that interlink with the achievement of multiple benefits from REDD+

Strategic objective 1: To improve the living conditions of affected populations

Expected impact 1.1. People living in areas affected by desertification/land degradation and drought to have an improved and more diversified livelihood base and to benefit from income generated from sustainable land management.

Expected impact 1.2. Affected populations' socio-economic and environmental vulnerability to climate change, climate variability and drought is reduced.

Strategic objective 2: To improve the condition of affected ecosystems

Expected impact 2.1. Land productivity and other ecosystem goods and services in affected areas are enhanced in a sustainable manner contributing to improved livelihoods.

Expected impact 2.2. The vulnerability of affected ecosystems to climate change, climate variability and drought is reduced.

Strategic objective 3: To generate global benefits through effective implementation of the UNCCD

Expected impact 3.1. Sustainable land management and combating desertification/land degradation contribute to the conservation and sustainable use of biodiversity and the mitigation of climate change.

(...)

Operational objective 2: Policy framework. To support the creation of enabling environments for promoting solutions to combat desertification/land degradation and mitigate the effects of drought.

Outcome 2.1: Policy, institutional, financial and socio-economic drivers of desertification/land degradation and barriers to sustainable land management are assessed, and appropriate measures to remove these barriers are recommended.

Outcome 2.2: Affected country Parties revise their national action programmes (NAPs) into strategic documents supported by biophysical and socio-economic baseline information and include them in integrated investment frameworks.

(...)

Outcome 2.5: Mutually reinforcing measures among desertification/land degradation action programmes and biodiversity and climate change mitigation and adaptation are introduced or strengthened so as to enhance the impact of interventions.

Operational objective 3: Science, technology and knowledge. To become a global authority on scientific and technical knowledge pertaining to desertification/land degradation and mitigation of the effects of drought.

Outcome 3.1: National monitoring and vulnerability assessment on biophysical and socioeconomic trends in affected countries are supported.

Outcome 3.2: A baseline based on the most robust data available on biophysical and socioeconomic trends is developed and relevant scientific approaches are gradually harmonized.

Outcome 3.3: Knowledge on biophysical and socio-economic factors and on their interactions in affected areas is improved to enable better decision-making.

Outcome 3.4: Knowledge of the interactions between climate change adaptation, drought mitigation and restoration of degraded land in affected areas is improved to develop tools to assist decision-making.

Outcome 3.5: Effective knowledge-sharing systems, including traditional knowledge,5 are in place at the global, regional, subregional and national levels to support policymakers and end users, including through the identification and sharing of best practices and success stories.

(...)

2.4 Already existing UNFCCC provisions on monitoring and reporting (independent of REDD+)

While the possible obligations for Parties concerning monitoring under a future REDD+ mechanism still remain to be decided, the Convention itself, as well as the decisions adopted by the Conference of the Parties (COP), set out a number of provisions that necessitate the collection of data which could be useful in the context of monitoring the results of REDD+ activities. With regard to the mitigation effects of REDD+, linkages to the regularly ongoing elaboration of national as well as project-related greenhouse gas balances are obvious and experiences made with such existing schemes will be drawn upon in the design of monitoring requirements for REDD+.

However, some of the existing data collection processes can also provide relevant information for the monitoring of multiple benefits, and these will be explored in the following.

All Parties to the Convention are required to develop and periodically update national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases (Art. 4.1 (a)). The requested contents, methodologies and submission timeframes depend on the status of Parties, with different provisions for developed country Parties (i.e. countries listed in Annex I of the Convention), non-Annex I countries, and least developed countries.

Since all activities supported by a future REDD+ mechanism will take place in developing countries, only the requirements for non-Annex I countries and the least developed countries among them are considered in the following.

According to the current UNFCCC Resource Guide for National Communications from non-Annex I Parties[13], Parties are encouraged to apply the IPCC Guidelines for National Greenhouse Gas Inventories published in 1997, 2000 and 2003. These guidelines define six sectors to be examined in the inventory: Energy; Industrial Processes; Solvent and Other Product Use; Agriculture; Land Use, Land-Use Change and Forestry (LULUCF); and Waste. Within these sectors, individual source and sink categories are defined (see examples in Box 6).

The guidelines also offer advice on the methods to be applied in the estimation of emissions or removals of greenhouse gases from the different source and sink categories, describing the basic activity data that need to be collected and the choice of emission factors for use in calculating the related amounts of gases that are released or sequestered as a consequence of the activity. The available methods are classified into three so-called tiers, with 'Tier 1' representing the simplest methods (usually based on basic activity data and default emission factors), and 'Tier 3' the most elaborate methods, requiring more disaggregated activity data and specific emission factors.

While the calculated amounts of greenhouse gases exchanged with the atmosphere are usually of little direct relevance to the monitoring of multiple benefits from REDD+, the underlying activity data may

[13] http://unfccc.int/resource/docs/publications/09_resource_guide3.pdf

often be more useful, especially in the inventory sectors for land use, land use change and forestry, agriculture and energy.

Another element of information requested in National Communications that might be of interest in the context of REDD+ monitoring is the description of steps taken to implement the Convention, i.e. an account of both the mitigation and adaptation measures that have been implemented (Art. 12.1).

However, as was noted by the COP in Dec. 8/CP.11, many non-Annex I Parties have had difficulties in preparing their national communications. As of September 2010, 137 non-Annex I Parties have submitted their first national communications (which, conditional upon the timely provision of financial resources, were due to be completed in 1994 for all non-Annex I Parties except least developed countries), but only 28 have handed in the second report (due in 2000 on the same conditions).

In line with suggestions developed at the 15th Conference of the Parties in 2009, a strengthening of the reporting framework for non-Annex I countries will be considered and the provisions on the timing and content of their National Communications could change after 2012 (UNFCCC 2009, FCCC/CP/2009/11/Add.1; Ellis et al. 2010).

In addition to the commitments related to national reports, Article 4.1 (g) of the Convention asks Parties, *inter alia*, to promote and cooperate in research, systematic observation and development of data archives related to the climate system and the further clarification of causes, effects, magnitude and timing of climate change.

Further requirements on assessment and monitoring are linked to certain activities in the implementation of the Convention. According to Article 4.1 (f), Parties should employ appropriate methods, for example impact assessments, with a view to minimizing adverse effects on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to climate change. More specific modalities apply to projects under the Clean Development Mechanism, which can only be registered if their possible environmental impacts have been analysed and a monitoring plan is provided which includes the collection and archiving of data related to these environmental impacts (Decision 3/CMP.1).

The results of such assessment and monitoring activities can include useful information for an examination of multiple benefits and safeguards for REDD+, for example if the assessed mitigation measures or CDM projects are based on changes in land use such as afforestation or reforestation, or if adaptation measures are designed to maintain or restore ecosystem services on which local communities depend.

Some of the national planning documents that countries are requested or encouraged to develop under the UNFCCC, such as national programmes for adaptation and mitigation (Art. 4.1 (b)) or the National Adaptation Programmes of Action that may be drawn up for least developed countries with support from the Least Developed Countries Fund, may contain provisions on monitoring the results of the planned activities. These may be relevant in the REDD+ context especially where ecosystem-based approaches to mitigation and adaptation are applied.

Table 3 (see Annex) sums up the relation between the different monitoring requirements set out under the UNFCCC and the indicative data needs for measuring multiple benefits of REDD+ activities as described in section 2.1.

Box 6: Examples of IPCC source and sink categories that can be relevant to the measurement of multiple benefits from REDD+

Sector 4: Agriculture: Enteric Fermentation, Agricultural Soils, Prescribed Burning of Savannas

Sector 5: Land-Use Change/Forestry: Changes in Forest and Other Woody Biomass Stocks (to be reported by forest types), Forest and Grassland Conversion (to be reported by ecosystem types), Abandonment of Managed Lands (to be reported by ecosystem types), CO2 Emissions and Removals from soil

3 Potential for synergies and remaining obstacles and gaps

As can be seen from the information outlined in the preceding sections and tables 1-3 in the Annex, there is a significant amount of commonality between the subjects addressed by existing or emerging processes related to monitoring under the Rio Conventions and the types of data that are likely to be of use for monitoring the multiple benefits of REDD+ activities. A summary overview of the degree of overlap is provided in Table 4.

It shows that in line with the primary concerns of the Rio Conventions, parameters linked to the status of biodiversity, climate change, pressures from land use change and ecosystem services related to water and soils are particularly well covered by their monitoring frameworks and requirements. Other aspects, such as ecosystem services related to non-timber forest products and tourism, fall within the general scope of issues to be addressed by monitoring according to one or several of the Conventions, but have received less emphasis in decisions and guidance to Parties. Therefore, the amount of available data on these is generally lower and more variable between countries.

On the whole, the provisions on monitoring under the Rio Conventions are comprehensive enough to suggest that the data derived from their implementation should allow some form of inferences to be made on most aspects of the success of REDD+ activities in enhancing multiple benefits. However, there are also a number of limitations to synergy for both conceptual and practical reasons.

Table 4: Indicative types of data for use in measuring multiple benefits of REDD+ activities and their relation with monitoring requirements of the Rio Conventions

X:Data need likely to be comprehensively addressed (x): Some relevant data may be available /: Data need not likely to be addressed

Data types	**CBD**	**UNCCD**	**UNFCCC**
Area covered by primary forest, secondary forest and plantations	**X**	(x)	(x)
Area covered by different types of forest ecosystems	(x)	(x)	(x)
Area covered by non-forest ecosystems of high biodiversity value	**X**	(x)	/
Conservation status of areas classified as priority areas for conservation	**X**	(x)	/
Conservation status of forest and non-forest species that have been selected as biodiversity indicators	**X**	(x)	(x)
Area with ecosystem qualities selected as indicators for biodiversity	(x)	(x)	(x)
Availability of sustainable flows of ecosystem services: clean water	(x)	**X**	(x)
Availability of sustainable flows of ecosystem services: flood protection	(x)	(x)	(x)
Availability of sustainable flows of ecosystem services: erosion control	(x)	**X**	(x)
Availability of sustainable flows of ecosystem services: prevention of anthropogenic fire damage	(x)	(x)	(x)
Availability of sustainable flows of ecosystem services: timber	/	(x)	(x)
Availability of sustainable flows of ecosystem services: non-timber forest products	(x)	(x)	(x)
Availability of sustainable flows of ecosystem services: forest genetic resources	**X**	/	/
Availability of sustainable flows of ecosystem services: attractions relevant for tourism	(x)	/	/
Availability of sustainable flows of ecosystem services: cultural and spiritual values	(x)	/	/
Financial, livelihood and governance-related benefit flows to local communities	(x)	(x)	(x)
Forest area subject to non-sustainable land use practices	**X**	**X**	(x)
Human-induced changes in occurrence of invasive alien species	**X**	(x)	(x)
Fragmentation of natural areas	**X**	/	/
Incidence of human-induced fires	(x)	(x)	(x)
Type, extent, location and direct results of REDD+ activities	(x)	(x)	(x)

Projected development of anthropogenic drivers and multiple benefits according to 'business as usual scenarios'	(x)	(x)	(x)
Actual development of anthropogenic drivers of change outside the scope of REDD+ activities	(x)	(x)	(x)
Occurrence of extreme events	(x)	(x)	(x)
Changes in climate	(x)	**X**	**X**

In terms of concept, the differences in mandate and focus between the agreements mean that the design of monitoring programmes under one Convention may often not be ideally suited for answering the questions faced by another.

For example, while all three Rio Conventions request Parties to collect data related to forest cover, the needs related to the classification of forest types are different:

- For CBD purposes, species composition and degree of human influence are important classification criteria, and for reasons of cost-effectiveness it might seem sensible to examine the status and trends of rare, threatened or highly diverse forest types more closely than those of species-poor intensively managed forests.
- Under the UNCCD, although plant and animal biodiversity is also one of the proposed indicators for monitoring the implementation of the Convention, less detailed classification schemes would probably seem sufficient, and only forests in areas affected by desertification and drought would be considered.
- From a UNFCCC perspective, forests would need to be divided into classes based on the average carbon stocks they contain.

If information from the different monitoring schemes is to be combined to provide a comprehensive picture of the multiple benefits provided by forests, it is likely that a deliberate effort would be needed to aim for compatibility in the design of data collection and interpretation methods and thus enhance the usefulness of the results for other processes without compromising the primary aims or cost-efficiency. There may be particular windows of opportunity for coordination when new monitoring schemes are being set up or existing programmes are upgraded. In the case of data obtained through remote sensing, one option to support the development of cross-compatible or even unified classification schemes is to carry out integrated ground-truthing studies which shed light on the correlations between different kinds of benefits.

Varying needs also exist with regard to the required resolution of monitoring data and the appropriate spatial reference units. For example, the location of activities within a country is of subordinate importance for the purpose of National Greenhouse Gas Inventories, which are primarily meant to provide summary figures and temporal trends of emissions at the national level. Thus data on certain uses of forests and other ecosystems could be derived by random sampling or from proxy data such as market statistics, or even by using internationally agreed default values (especially in countries applying Tier 1 methods). Assessing the impact that these activities have on high nature value ecosystems or

ecosystems threatened by desertification, on the other hand, will be impossible without spatially explicit information.

As mentioned in section 2.1, monitoring the multiple benefits of REDD+ would ideally require disaggregation of data to a level that allows relating trends in the targeted benefits to the areas where REDD+ activities are taking effect. The scale of disaggregation will depend not only on the type of activities (e.g. direct interventions in land management vs. changes in legal or financial incentives), but also on the nature of the benefits being examined, as some of these may be more localized in their effects than others (e.g. provision of non-timber forest products used for subsistence by local communities vs. improvement of the hydrological balance in a watershed).

Progress in the range of information that can be obtained through remote sensing methods will help to decrease problems related to resolution for many but not all of the data types required.

From a practical point of view, a further challenge to achieving synergies is added by the fact that the sets of indicators developed under both the CBD and UNCCD are still evolving, as well as by the fact that all three Rio Conventions allow Parties a certain degree of freedom in the design of their monitoring systems.

Also, as has been noted before, not all provisions on reporting and monitoring are as yet fully implemented, and a shortage of technical, financial and institutional capacities for data collection and management is likely to remain a limiting factor for each of the monitoring processes as well as for the creation of synergies in many of the countries that will be eligible to participate in a REDD+ mechanism.

However, the issue of limited resources is at the same time one of the most powerful arguments in favour of efforts to reduce duplication of work and create a pool of environmental and socio-economic information that can inform the coherent implementation of several multilateral environmental agreements.

In addition to the ongoing activities within the framework of the CBD, UNCCD and UNFCCC, a number of further monitoring processes prompted by multilateral environmental policy (e.g. in the field of forest governance), as well as schemes run by NGOs or academic institutions and monitoring activities linked to certification and offset schemes might offer potential for synergies (Teobaldelli et al. 2010, Makundi 1997) and should be taken into account when designing approaches to measuring the multiple benefits from REDD+.

4 Conclusion

There is clearly a significant potential for synergies between the monitoring processes that have been initiated under the three Rio Conventions, and any future monitoring system established for measuring the multiple benefits from REDD+ activities.

The precise nature and extent of possible synergies, as well as the obstacles to using monitoring data across processes will depend on the situation of each country; e.g. on the approaches that have been chosen for existing monitoring programmes, on the degree to which these programmes have been

implemented, and on the choices that are made with regard to the multiple benefits aimed for in REDD+ activities.

A systematic national level stock-taking of the issues that should be addressed through the REDD mechanism as well as of opportunities and challenges to meeting related data needs, including through drawing on existing monitoring schemes, is thus a crucial step to ensure that efforts are spent effectively.

Decision-makers and technical staff involved in the design and implementation of monitoring programmes for REDD+, as well as their counterparts engaged in addressing other monitoring requirements arising from the Rio Conventions, need to be made aware that the benefits to be obtained through joining forces between the different processes will be of a mutual nature.

Even in cases where existing monitoring programmes do not yield readily available data of the precise type and resolution needed, it is likely that the experiences made in their establishment and implementation could be of use to the development of multiple benefits monitoring for REDD+.

On the other hand, activities within the context of REDD+ can provide much-needed support to national efforts to strengthen the ongoing monitoring processes under each of the Rio Conventions in line with the increased emphasis on measurement of achievements and on results-based management that has been called for by their governing bodies. They can also be used as an opportunity to promote collaboration and mutual understanding across Conventions.

At the international level, an important contribution facilitating the uptake of expertise, experience and existing work particularly from the spheres of the CBD and UNCCD in the design of monitoring schemes for the multiple benefits of REDD+ could be made by developing guidance on options for measuring the performance of REDD+ measures related to those additional benefits that fall within the mandate of each Convention.

Activities along this line have recently been proposed in the outcomes of a global expert workshop on the biodiversity benefits of reducing emissions from deforestation and forest degradation in developing countries, which pointed out that the CBD could support the implementation of REDD+ *inter alia* by developing a framework for monitoring its impacts on biodiversity (UNEP/CBD/WS-REDD/1/3, CBD 2010c).

By pro-actively offering relevant guidance of a technical nature, without prejudging negotiations under the UNFCCC, the Parties to the CBD and UNCCD could ensure that suitable information is made available in a timely manner, and opportunities for synergy can be addressed effectively in the process of setting up monitoring systems for a future REDD+ mechanism if and when it is agreed. Already now, the guidance could also provide valuable support to countries wishing to address multiple benefits within their efforts to achieve REDD readiness and implement pilot or demonstration activities.

5 References

Butchart, S.H.M., Walpole,M., Collen, B., van Strien, A., Scharlemann, J.P.W., Almond, R.E., Baillie, J.E.M., Bomhard, B., Brown, C., Bruno, J., Carpenter, K.E., Carr, G.M., Chanson, J., Chenery, A., Csirke, J., Davidson, N.C., Dentener, F., Foster, M., Galli, A., Galloway, J.N., Cenovesi, P., Gregory, R.D., Hockings, M., Kapos, V., Lamarque, J.-F., Leverington, F., Loh, J., McGeoch, M.A., McRae, L., Minasyan, A., Hernández Morcillo, M., Oldfield, T.E.E., Pauly, D., Quander, S., Revenga, C., Sauer, J.R., Skolnik, B., Spear, D., Stanwell-Smith, D., Stuart, S.N., Symes, A., Tierney,M., Tyrrell, T.D., Vié, J.-C., & Watson, R. (2010) Global biodiversity: indicators of recent declines. Science, 328, 1164-1168.

CBD (2010a) Implementation of the Convention and the Strategic Plan and Progress towards the 2010 Biodiversity Target. Conference of the Parties to the Convention on Biological Diversity. 10th meeting. UNEP/CBD/COP/10/8.

CBD (2010b) 2010 Biodiversity Indicators and post-2010 Indicator Development. Note by the Executive Secretary. UNEP/CBD/SBSTTA/14/INF/14.

CBD (2010c) Outcomes of the Global Expert Workshop on Biodiversity Benefits of Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. UNEP/CBD/WS-REDD/1/3.

Ellis, J., Moarif, S., Briner, G. (2010) Core Elements of National Reports. OECD and IEA. COM/ENV/EPOC/IEA/SLT(2010)1.

Grainger, A. (2009) Developing a baseline survey for monitoring biophysical and socio-economic trends in desertification, land degradation and drought. Consultancy report prepared for the UNCCD Secretariat. Available at: http://www.unccd.int/science/docs/Developing%20a%20baseline%20survey%20-%20for%20the%20web_2010.pdf

Makonga, V. (2010) Plan de Préparation à la REDD 2010-2012 du République Démoractique du Congo, http://www.forestcarbonpartnership.org/fcp/sites/forestcarbonpartnership.org/files/Documents/PDF/Mar2010/RDC_R-PP_version_2_mars_2010_Francais.pdf

Makundi, W. (1997) Global Climate Change Mitigation and Sustainable Forest Management – the Challenge of Monitoring and Verification. Mitigation and Adaptation Strategies for Global Change, 2, 133-155.

Manh Cuong, P., Minh Thoa, P., Infield, M., Mackenzie, C., Vickers, B., Kempinski, J., Hughes, R., Sage, N., Hieu Minh, T., & Van Chuong, C. (2008) Socialist Republic of Vientnam R-PIN. http://www.forestcarbonpartnership.org/fcp/sites/forestcarbonpartnership.org/files/Documents/PDF/Vietnam_FCPF_R-PIN_0.pdf

Niemeijer,D. (2002) Developing indicators for environmental policy: data-driven and theory-driven approaches examined by example. Environmental Science & Policy, 5, 91-103.

SCBD / Secretariat of the Convention on Biological Diversity (2010) Global Biodiversity Outlook 3. Montreal.

Teobaldelli, M., Doswald, N., Dickson, B. (2010) Monitoring for REDD+: carbon stock change and multiple benefits. Multiple Benefits Series 3. Prepared on behalf of the UN-REDD Programme. UNEP World Conservation Monitoring Centre, Cambridge, UK.

UNCCD (2007) Benchmarks and indicators for monitoring and assessment of desertification. Addendum to the Report of the fifth meeting of the Group of Experts of the Committee on Science and Technology. ICCD/COP(8)/CST/2/Add.1

UNEP-WCMC (2009) International Expert Workshop on the 2010 Biodiversity Indicators and Post-2010 Indicator Development. UNEP-WCMC, Cambridge, UK.

UNEP-WCMC (2010) Piloting Integrated Processes and Approaches to Facilitate National Reporting to Rio Conventions. Component 1: Situation Analysis and Reporting Process Design. Report on reporting requirements of the three conventions. UNEP-WCMC, Cambridge.

UNFCCC (2008) Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007. Addendum. Part two: Decisions adopted by the Conference of the Parties. FCCC/CP/2007/6/Add.1

UNFCCC (2009) Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009. Addendum. Part Two: Action taken by the Conference of the Parties at its fifteenth session. FCCC/CP/2009/11/Add.1

UNFCCC (2010) Negotiating text. Note by the Secretariat. Ad hoc working group on long-term cooperative action under the convention. 12th Session. FCCC/AWGLCA/2010/14

Annex

Table 1: Indicative data categories for use in measuring multiple benefits of REDD+ activities and their relation with monitoring requirements and indicators of the Convention on Biological Diversity (please note that some requirements and indicators are relevant to several data categories)

Data categories	Monitoring according to Article 7 and Programmes of Work	Global Headline Indicators	*Proposed new indicators (Doc. UNEP/CBD/COP/10/9)*
Status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits (see Box 1 for more specific examples of the possible information needs)	Article 7: Monitoring of selected components of biodiversity at the level of ecosystems, species and genes (taking into account criteria such as degree of threat, uniqueness, representativeness, social, economic, cultural or scientific importance) Programmes of Work: e.g. those on Forests, Dry and Sub-Humid Lands, Agricultural Biodiversity, Inland Waters and Protected Areas; also relevant decisions on Sustainable Use and Tourism and Biodiversity	• Trends in extent of selected biomes, ecosystems and habitats • Trends in abundance and distribution of selected species • Change in status of threatened species • Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance • Trophic integrity of other (than marine) ecosystems[a] • Water quality of freshwater ecosystems • Incidence of human-induced ecosystem failure[a] • Health and well-being of communities who depend directly on local ecosystem goods and services[a] • Biodiversity for food and medicine[a]	• *Stocks and flows of natural capital* • *Incidence of hypoxic zones and algal blooms* • *Status and trends of land use in indigenous peoples' territories* • *Status and trends in the practice of traditional occupations* • *Storage of carbon and other GHG (using UNFCCC inventories supplemented by scientific assessments)*
Status and trends of anthropogenic pressures (see Box 1 for more specific examples of the possible information needs)	Article 7: Monitoring of the effects of processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity. Programmes of Work: same as above, also decisions on Invasive Alien Species	• Area of forest, agricultural and aquaculture ecosystems under sustainable management • Proportion of products derived from sustainable sources[a] • Connectivity/fragmentation of ecosystems • Trends in invasive alien species	

Data categories	**Monitoring according to Article 7 and Programmes of Work**	**Global Headline Indicators**	***Proposed new indicators (Doc. UNEP/CBD/COP/10/9)***
Data on REDD+ activities and external factors (see Box 1 for more specific examples of the possible information needs)	Concerning REDD+ activities: No direct monitoring requirements; information of a general type is likely to be collected for inclusion in National Reports Concerning external factors: Article 7: Monitoring of the effects of processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity. Programmes of Work: same as above, also decisions on Invasive Alien Species and Biodiversity and Climate Change.	Concerning external factors: • Area of forest, agricultural and aquaculture ecosystems under sustainable management • Proportion of products derived from sustainable sources[a] • Ecological footprint and related concepts[a] • Trends in invasive alien species • Nitrogen deposition	Concerning external factors: • *Value of subsidies harmful to biodiversity* • *Status and trends of land use in indigenous peoples' territories* • *Assessment of vulnerability and adaptive capacity* • *Total nutrient use, nutrient loading in fresh water and marine areas* • *The Red List Index for impacts of invasive alien species*

[a] Indicators confirmed as requiring more work.

Table 2: Indicative data categories for use in measuring multiple benefits of REDD+ activities and their relation with monitoring requirements and the provisional impact indicators of the United Nations Convention to Combat Desertification (please note that some requirements and indicators are relevant to several data categories)

Data categories	**Monitoring according to Articles 10 and 16**	**Provisional impact indicators** (in bold: indicators required for use in the next reporting cycle)
Status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits (see Box 1 for more specific examples of the possible information needs)	Article 10: Regular review of implementation of National Action Programmes to combat desertification and mitigate the effects of drought. (This could entail measuring the success of activities contained in NAPs through the collection of data on issues such as trends in the status of natural resources including agricultural and pastoral land, forests, vegetation cover and wildlife, biodiversity, and water resources; trends in income and employment opportunities for the poor, security of land tenure and delegation of responsibility for land management to local populations and communities [a].) Article 16: Systematic observation of land degradation in affected areas, assessment of processes and effects of drought and desertification. (This could entail the collection of data on issues such as vegetation degradation, soil degradation, water resources, and economic and social welfare[b].)	• Change in land use • Carbon stocks above and below ground • Plant and animal biodiversity • Water availability per capita in affected areas • Level of land degradation (including salinization, water and wind erosion, etc.) • **Proportion of the population in affected areas living above the poverty line** • Childhood malnutrition and/or food consumption / calorie intake per capita in affected areas
Status and trends of anthropogenic pressures (see Box 1for more specific examples of the possible information needs)	Article 10: Regular review of implementation of National Action Programmes to combat desertification and mitigate the effects of drought. (E.g. collection of data on issues such as trends in the application of sustainable forms of natural resources management [a].) Article 16: Systematic observation of land degradation in affected areas, assessment of processes and effects of drought and desertification. (E.g. collection of data on anthropogenic pressures which are thought to contribute to desertification.)	• **Land cover status** • Land under Sustainable Land Management
Data categories	**Monitoring according to Articles 10 and 16**	**Provisional impact indicators** (in bold: indicators required for use in the next reporting cycle)

Data on REDD+ activities and external factors (see Box 1 for more specific examples of the possible information needs)	Article 10: Regular review of implementation of National Action Programmes to combat desertification and mitigate the effects of drought. (E.g. collection of information on activities carried out against desertification and the effects of drought.) Article 16: Systematic observation of land degradation in affected areas, assessment of processes and effects of drought and desertification. (E.g. collection of data on developments related to factors that contribute to desertification such as trends in land use or climate change.)	• Change in land use • Land under Sustainable Land Management • Aridity index

[a] Examples are based on the suggested contents of NAPs according to Annex I Article 8 of the Convention (Regional Implementation Annex for Africa, Content of National Action Programmes)
[b] Examples are based on the recommendations contained in Grainger (2009).

Table 3: Indicative data categories for use in measuring multiple benefits of REDD+ activities and their relation with input data needed for the compilation of National Greenhouse Gas Inventories and other monitoring requirements under the United Nations Framework Convention on Climate Change (please note that some monitoring requirements are relevant to several data categories)

Data categories	**Input data needed for National Greenhouse Gas Inventories** (examples based on guidance for Non-Annex I countries)	**Other monitoring requirements**
Status and trends of natural forests, biodiversity and ecosystem services, and other social and environmental benefits (see Box 1 for more specific examples of the possible information needs)	• Changes in forest area • Forest and grassland areas converted to cropland and pasture • Areas of organic soils converted to more intensive land use	Art. 4.1 (f): impact assessment of climate change mitigation activities Art. 4.1 (f): impact assessment of climate change adaptation activities Monitoring of results of national programmes for adaptation and mitigation Clean Development Mechanism: Impact assessment and monitoring of impacts of CDM project activities
Status and trends of anthropogenic pressures (see Box 1 for more specific examples of the possible information needs)	• Fuelwood consumption • Land abandonment	Monitoring of results of national programmes for adaptation and mitigation Clean Development Mechanism: Impact assessment and monitoring of impacts of CDM project activities
Data on REDD+ activities and external factors (see Box 1 for more specific examples of the possible information needs)	• Livestock population • Total use of synthetic fertilizer in country • Crop production	Art. 12.1: provision of information on mitigation and adaptation measures taken Art. 4.1 (f): impact assessment of climate change adaptation activities Monitoring of results of national programmes for adaptation and mitigation Art. 4.1 (g): systematic observation related to climate change