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(Kurztitel: F+E Bio-global)

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Sustainability Standards for internationally traded Biomass

Biodiversity and Land-Use

– Working Paper –

prepared for UBA/BMU

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Content

Introduction

This paper is part of an ongoing research project of Öko-Institut and IFEU commissioned by the German Ministry for Environment (BMU) through the Federal Environment Agency (UBA). The project addresses sustainability issues of globally traded biomass and the options to implement respective standards.

The scope of this issue paper is to present the general approach suggested from the project team. It is meant to open the floor for discussing **further** issues that are not yet sufficiently developed for implementation, and need further consideration, as well as scientific and political discussion.

A previous UBA study on sustainability criteria for biomass recommended continuing work on potentially negative biodiversity impacts of bioenergy development, and researching adequate approaches to safeguard against such impacts[1].

Following-up on this recommendation, the working paper outlines an approach for land-use-related biodiversity concerns associated with bioenergy production.

The objectives of this paper are:

- to provide background information on the status of the international discussion on protecting biodiversity;.
- to present a draft framework on how to identify areas relevant for the protection of biodiversity, including existing databases which could be used in that regard; and
- to indicate open questions and issues to be addressed in further work.

The authors welcome comments and critique, and invite readers to provide written feedback.

1 "Criteria for a Sustainable Use of Biofuels on a Global Scale" , prepared by IFEU (Institut für Energie- und Umweltforschung) in cooperation with FSC (Forest Stewardship Council) Germany Working Group, and Germanwatch; to be pubished in early 2008

1 Background Information

1.1 Protection of Biodiversity

Biodiversity is directly linked to properties and quality of habitats (Strand 2007) and its loss, reduction and degradation are key main threads to global commons. A prominent example of the loss of biodiversity-rich habitats is the ongoing deforestation in the tropics (FAO 2006, Wassenaar 2007). Other prominent factors causing the decline of biodiversity are habitat fragmentation and isolation, land-use intensification and overexploitation, species invasions as well as impacts of climate change[2].

Industrial biomass production bears the potential to alter valuable habitats by *direct effects* (e.g. land-use change, land-use practice) and *indirect* once (e.g. edge effects), and – in consequence – may lead to an increasing loss of biodiversity (Fritsche et al. 2006, SRU 2007).

The necessity to protect natural resources including biodiversity is broadly accepted and addressed by international organisations like IUCN, WCMC and in legal terms by the Convention on Biological Diversity (CBD) which was agreed at the 1992 Earth Summit and, to date, has been ratified by 188 nations.

Its three main goals are (1) the conservation of biological diversity, (2) the sustainable use of its components and (3) the equitable sharing of benefits arising out of the utilization of genetic resources (Dudley/ Parish 2006). The establishment of Protected Areas (PA) is one common instrument to reach these goals (see Section 2.2.1.2).

However, the implementation of conservation goals for the protection of biodiversity requires strategies for managing whole landscapes, including areas allocated to both production and protection. Protection areas as cornerstones of regional conservation strategies should sample or represent the biodiversity of each region, and they should separate this biodiversity from processes threatening its persistence (Margules/ Pressey 2000).

Existing PA throughout the world contain only a biased sample of biodiversity, usually that of remote places and other areas unsuitable for commercial activities (Margules/Pressey 2000). Thus, they do not – as yet – come near to fulfilling global biodiversity commitments, nor the needs of species and ecosystems, given that a large number of these species, ecosystems and ecological processes are not adequately protected by the current PA network (Dudley/Parish 2006).

2 See e.g., Groom et al. (2006), and Lindenmayer//Fischer (2006).

In this regard, **gap analysis**[3] is a method to identify biodiversity (i.e., species, ecosystems and ecological processes) not adequately conserved within a PA network or through other long-term conservation measures (Scott et al. 2001). Today, gap analysis is still an ongoing effort (Dudley/Parish 2006, Langhammer et al. 2007).

The CBD recognises the limitations of PA as the sole tools for conservation, and promotes an Ecosystem Approach that seeks to mainstream biodiversity conservation into broader land- and seascapes (Smith/Maltby 2003, Dudley/Parish 2006). The Ecosystem Approach is a strategy for the integrated management of land, water and living resources that advances conservation and sustainable use in an equitable way.[4]

The approach of sustainable use can be interpreted as one element within the overarching framework of the Ecosystem Approach (IUCN 2004). The holistic concept of the Ecosystem Approach as a framework for decision-making and action includes an integrated land-use planning that seeks the appropriate balance between nature conservation and use of biodiversity. This implies a high degree of complexity in management, which includes ecological, socioeconomic, cultural, and political issues[5].

For example, in Europe Areas of High Nature Conservation Value (HNCV) farmland contains the most biodiversity-rich areas within agricultural landscapes. Such systems have long been threatened by two different trends: intensification and abandonment. Outside PA, conservation of HNCV farmland depends mainly on the application of instruments of the Common Agricultural Policy (CAP), but various additional policy measures would be needed to tackle biodiversity decline on this farmland (EEA 2004, 2005).

Concerning the protection of biodiversity, an “ideal world” would comprise a PA network sufficiently covering biodiversity patterns all around the world as well as its embedding in managed landscapes respecting sustainability criteria for biodiversity.

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3 According to Dudley/Parish (2006), gap analysis requires the following six steps: (1) Identify focal biodiversity and set key targets, (2) evaluate and map the occurrence and status of critical biodiversity, (3) analyse and map the occurrence and status of protected areas, (4) use the information to identify gaps, (5) prioritise gaps to be filled and (6) agree on a strategy and take action.

4 Information on the principles of the Ecosystem Approach is available at: http://www.cbd.int/ecosystem/description.shtml and http://www.cbd.int/ecosystem/principles.shtml

5 See overview in Smith/Maltby (2003), Groom et al. (2006), and Hartje/Klaphake (2006)

Today we are far away from this vision, though e.g., CBD activities within the Programme of Work on Protected Areas (PoWPA) contribute to improve the situation[6]. Therefore, a **risk mitigation strategy** for threads on biodiversity from a sustainable industrial biomass production needs to be elaborated.

1.2 Biodiversity in the BSO

The German Biofuels Sustainability Ordinance (BSO) is a first attempt effort to minimize negative impacts of biofuel development on both biodiversity and agrobiodiversity, with a strong focus on the protection of relevant habitats containing high biodiversity (PA and HNCV, see Box 1).

The concept of HNCV, however, is relatively new, and no internationally accepted definition is currently available[7]. Examples of application are in Europe the EEA work on HNCV farmland, and activities of FSC to define High Conservation Value Forests (HCVF).

From the biodiversity point of view, the Key Biodiversity Areas (KBA) concept may stimulate the discussion on HNCV. KBA uses globally standard criteria and thresholds, based on the needs of biodiversity requiring safeguards at the site scale, including vulnerability and irreplaceability (Landhammer et al. 2007). KBA focuses on priority-stetting and systematic conservation planning, whereas HNCV (and, hence, the BSO) follows more a “containment approach” aiming to identify areas which might be of relevance for conservation planning (see Groves 2003).

Beside protection of natural habitats to conserve biodiversity, also the farming systems should not cause significant deterioration of species and ecosystem diversity (§ 2 para 2, BSO).

Thus, conservation of biodiversity should not only be restricted to PA and HNCV, but should be considered **within** cultivation in the so-called matrix approach in which agrobiodiversity is also considered, as well as fragmented landscapes and impaired connectivity which may negatively affect biodiversity in PA and HNCV areas.

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6 See as example the Eastern Europe Regional Workshop “Strengthening the Capacity of Governments to Implement Priority Activities of the CBD PoWPA”, Isle of Vilm, 17-21 June 2007 (Gawler 2007).

7 see definitions in the Glossary.

Box 1: Protection of natural habitats, § 3 BSO

(1) The requirements pertaining to the protection of natural habitats as defined Section 1, paragraph 1, no. 1, letter b shall be regarded as fulfilled if the biomass used is not grown in nature reserves or in areas which had been identified as of 1 January 2005 as areas of high natural conservation value or subsequently declared as such.

(2) Areas of high natural conservation value are areas which, as rare ecosystems, have significant nature conservation value or serve as habitats for particularly rare species of plants or animals. These areas are characterized by one or more of the following features:

1. areas which exhibit, in globally or regionally significant levels, accumulations of protectable resources of relevance to biodiversity (e.g. endemic or endangered species, refuges);
2. areas which lie in globally or regional rare, threatened or endangered ecosystems or which encompass such ecosystems;
3. areas which serve fundamental protective functions.

(3) Paragraph 1 shall not apply in cases in which cultivation of the biomass is in conformity with the protection objectives of the protected area in question or

2 Global Land Categories and Classification and Inventory

2.1 Global Land Categories

To address sustainable production of biomass on the industrial scale, spatial information is needed on biomass origin and production conditions, for which Geographical Information Systems (GIS) are adequate data storage and management tools. For generic applicability, we propose a concept as well as a classification and inventory on the following general categories[8]:

1. **Protected Area (PA):** These areas are dedicated to the protection of biodiversity, agrobiodiversity, and natural and associated cultural resources. PA are defined through their legal status, and their preservation requires adequate land management, and enforcement of land-use restrictions.

2. **Areas of High Nature Conservation Value (HNCV):** HNCV are characterised by a significant nature conservation value due to their high amount of natural recourses (biodiversity, ecosystem functions, etc.). Though worth to be protected, these areas have not (yet) a legal conservation status.

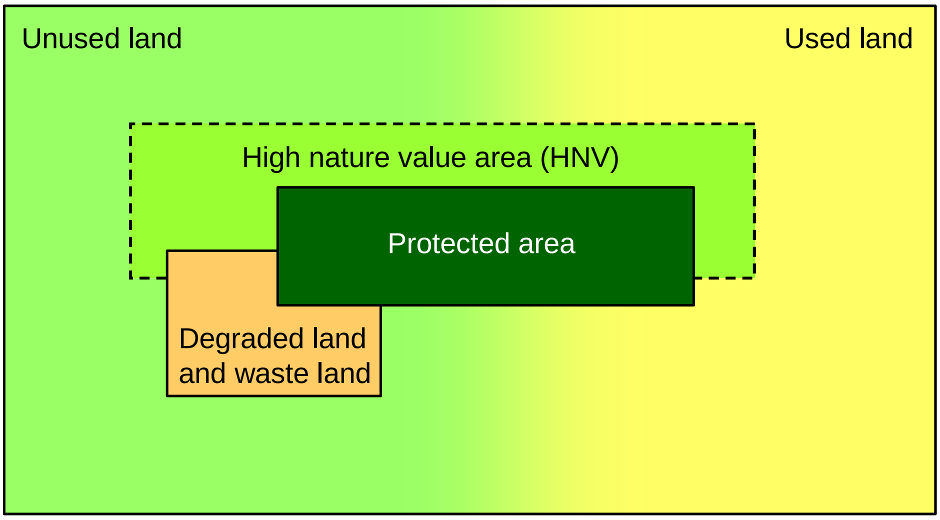
3. **Used land and unused land** refer more to a gradual change from intensely used land towards land that is not influenced by any "productive" use. Agriculture, forestry and infrastructure can clearly be considered as **used land** to meet humans needs (food, feed, fibre, and infrastructure), whereas for extensive land-use forms (e.g., collection of medical plants, sporadic hunting), it is difficult to decide up to which use-intensity land is still considered as "used". Furthermore, biophysical parameters like organic carbon in soils, precipitation, and land cover do not reflect the social side of "use" (e.g., nomad land). **Unused land** comprises abandoned farmland, degraded, devastated and waste lands as well as areas of undisturbed wildlife, and pristine natural areas.

4. **Degraded land and waste land:** Degraded land comprises former suitable (used) land that has been turned unsuitable by a degradation process, i.e. it is not used any more for agriculture and other (land-associated) human activities. Degraded land still holds the **potential** to be restored by adequate measures, though. Waste land is characterised by natural physical and biological conditions that are per se unfavourable for (land associated) human activities (Oldemann et al. 1991). Degraded land – and to some extent also waste land – might be prior areas for biomass production to reduce land competition between the production of food, feed, fibre, and fuel.

8 see also definition in the Glossary. A spatial overlap of the categories is intended, as they address different scopes of sustainable biomass production.

The principal spatial relation and overlap of these land categories are illustrated in Figure 2-1. This paper mainly addresses PA and HNCV.

Figure 2-1 Illustration of the spatial relation between suggested area types.



Source: Öko-Institut

2.2 Concept for Identifying Biodiversity-Relevant Areas

The framework proposed in this paper is based on two steps:

1. collecting available data to identify areas relevant for the protection of biodiversity, and storing them in a comprehensive geographical information system (GIS), and
2. initiating a process to decide where and how biodiversity is to be protected by screening the GIS data with respective criteria (see Figure 2-2).

2.2.1 Available GIS data

2.2.1.1 Country's frontiers and Ecoregions

To identify biodiversity-relevant areas in the context of sustainable industrial biomass production, a comprehensive GIS is needed so that the spatial extension and distribution of PA and HNCV can be communicated to decision makers, conservation planners, farmers and trade companies as well as certification bodies (see Figure 2-1).

Such a GIS platform should provide globally available data sets described below, as well as the possibility to enter regional, national and local data sets to enhance the quality of analyses.

Due to the complex distribution of the Earth's natural resources, both the specification of land-use practices as well as the development of strategies for conservation purposes require to distinguished land- and seascapes with a meaningful biogeographic and/or ecological resolution.

From the view point of biodiversity the **Ecoregion** approach (Olson et al. 2001, Olson/Dinerstein 2002) seems to be most adequate for down-scaling. For this approach, 867 distinct spatial units have been delineated through the combination of existing global ecoregion maps, global and regional maps of the distribution of selected groups of plants and animals, and vegetation types, and through consultation with regional experts. Ecoregions reflect the distributions of a broad range of fauna and flora across the entire planet and they are classified within the familiar system of biogeographic realms and biomes. For several regions, detailed assessments of biodiversity as well as its thread has been carried out[9]

Due to the advantages of Ecoregions compared to other global ecosystem classifications, the assessment of biodiversity within the Millennium Ecosystem Assessment (MA) used Ecoregions for regionalisation (Mace et al. 2005).

In addition, WWF implemented an online-database[10] which gives for each Ecoregion information on (1) location and general description, (2) biodiversity features, (3) current status, (4) threats as well as (5) ecoregion justification.

Implementation, however, is often restricted to political units represented by nations (or groups of nations). Therefore, we suppose to stratify the surface of each nation according to Ecoregions, and to carry out further differentiation on a **national scale** within each Ecoregion.

It should be kept in mind, though, that country territories do not necessarily coincide with the natural distribution of species and communities[11].

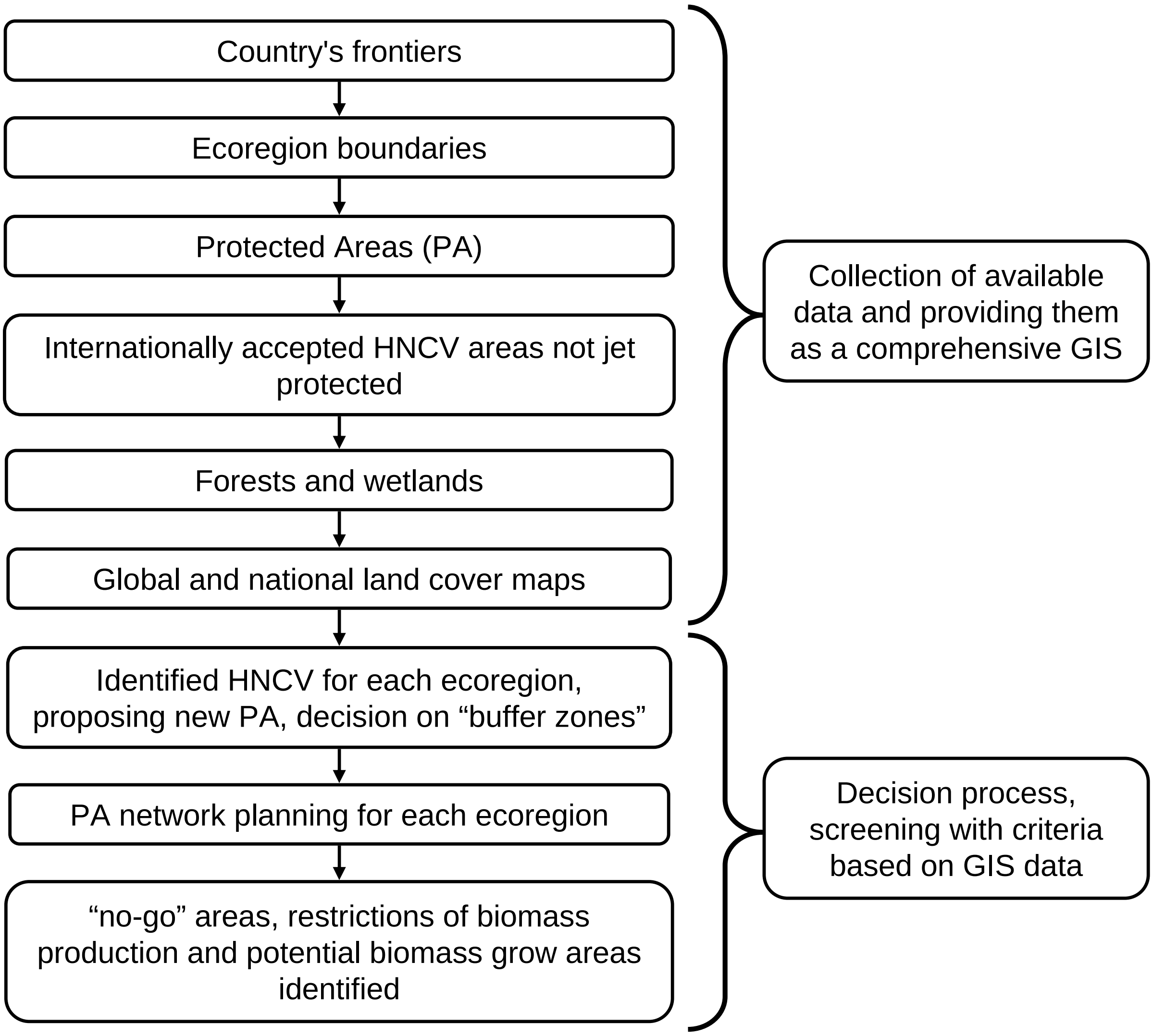
Thus, conservation of biodiversity will require cross-border planning.

9 For example, North America: Ricketts et al. (1999); Mid- and South America: Dinerstein et al. (1995); Africa and Madagascar: Burgess et al. (2004); Asia: Wikramanayake et al. (2002).

10 Ecoregion data base: http://www.worldwildlife.org/science/ecoregions/biomes.cfm

11 For example, large mammals in Africa, - see Burgess et al. (2004)

Figure 2-2: Framework for Biodiversity-relevant Areas.



Source: Öko-Institut

2.2.1.2 Protected Areas

The location of PA regulated under a range of legal and customary arrangements is in most cases well-known (see Figure 2-1). The World Database on Protected Areas (WDPA)[12] based on the UN List of Protected Areas offers the globally most comprehensive GIS based platform which can be directly integrated into the suggested required geographical database (Strand et al. 2007).

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12 IUCN Protected Area Management Category System; http://www.unep-wcmc.org/wdpa/index.htm

Roughly 12% of the global land surface is currently protected in one or the other legal or customary arrangement designed to ensure the conservation of important ecosystem benefits (Dudley/Parish 2006).

Countries participating in a certification system should guarantee that all their PA are entered in the WDPA – either manually, or by data transfer from national or regional databases (e.g. NATURA 2000 in Europe[13]), and be consistent with the nomenclature in "The IUCN Protected Area Management Category System" (Dudley/ Phillips 2006)[14].

2.2.1.3 Internationally accepted HNVC, Forests and Wetlands

The identification of **HNCV** is more challenging, as no internationally accepted definition of the term HNCV exists[15]. The definition of HNCV used within the BSO is given in Box 1.

Independent from a global definition of the term HNCV accepted by international players, it appears necessary to raise the significance of the term HNCV on the national scale in combination with addressing clear conservation targets and indicators[16] (e.g. Bubb et al. 2005). Concerning biodiversity, existing global databases on areas that are important for their conservation value may be useful to identify HNCV (see Figure 2-2).[17]

New biodiversity hotspot analyses carried out from Conservation International define 35 hotspots which should become conservation areas with priority. Based on the idea to protect HNCV several similar approaches have been proposed[18].

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13 NATURA 2000: http://www.bfn.de/0316_natura2000.html; FFH: http://www.ffh-gebiete.de/

14 The IUCN Protected Area Management Categories: http://www.iucn.org/themes/wcpa/wpc2003/pdfs/outputs/pascat/pascatrev_info3.pdf

15 see Oppermann et al. 2007 as well as Section 1.2

16 According to Bubb et al. (2005) indicators can be described as measures or metrics based on verifiable data that conveyed information about more than just themselves. Fundamental aspects of indicators are, that (1) they are only of any use if they address questions to which someone wants to know the answer, and (2) that they are only feasible if the data to generate them can be obtained.

17 Examples are databases on biodiversity-rich areas (e.g. Biodiversity Hotspots, Important Bird Areas = IBA, Important Plant Areas = IPA), data on biodiversity-rich habitat types such as specific forest types (e.g. Global Forest Resources Assessment, FRA 2000 and FRA 2005) and wetlands (e.g. Global Lakes and Wetlands Database GLWD) as well as data on areas of undisturbed wildlife (e.g. Biodiversity Wilderness Areas). A detailed list on online-data sources for identifying and delineating biodiversity relevant areas is given in Langhammer et al. (2007).

18 See also the overview in Kent et al. (2003), Redford et al. (2003), and Langhammer et al. (2007).

In 2005, a cooperation of large international organisations (such as WWF, Birdlife International, Conservation International and IUCN) formed an Alliance for Zero Extinction (AZE) which identified 595 areas that worldwide harbour remaining populations of nearly 800 highly endangered species (Ricketts et al. 2005).

Other existing site-scale datasets are Important Bird Areas and Important Plant Areas.[19] Some of these data bases are already included in international biodiversity targets (e.g., the list of Important Plant Areas is addressed in the Global Strategy for Plant Conservation – CBD COP VI, decision VI/9).

Especially **forests** and **wetlands** often carry natural or near-nature ecosystems, and their importance for the protection of biodiversity is well known. Strand et al. (2007) give a comprehensive overview on the performance of remote sensing data with a focus on forests[20]. The protection of wetlands is already addressed within the Ramsar Wetland Convention. The currently most comprehensive database of wetlands on a global level is provided by Lehner/Döll (2004)[21], but also land-cover databases represent – to some extend – wetlands (e.g., GLC 2000).

In addition to the protection of biodiversity hotspots, Conservation International proposed the protection of Biodiversity Wilderness Areas (Mittermeier et al. 1998), areas of currently low human impact but harbouring lower biodiversity than hotspots. However, these areas complete but not displace biodiversity hotspots within international conservation strategies (Mittermeier et al. 2003). Also, remote sensing may support the identification of further areas of undisturbed wildlife.[22]

2.2.1.4 Global and National Land Cover Maps

Land-cover maps of high quality are a fundamental requirement for many purposes. With regard to the identification of biodiversity-relevant areas, land-cover data are vital, as biodiversity is directly link to habitats and their quality reflected by land-cover classes (see Section 1.1).

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[19] Alliance for Zero Extinction (AZE) sites: www.zeroextinction.org/;
Important Bird Areas www.birdlife.net/datazone/sites/index.html;
Important Plant Areas: www.plantlife.org.uk/html/important_plant_areas/important_plant_areas_index.htm.
A detailed list on online-data sources for identifying and delineating biodiversity relevant areas is given in Langhammer et al. (2007).

[20] For example, The Global Land Cover 2000 (GLC2000, see Bartholomé/ Belward 2005): http://www-gvm.jrc.it/glc2000/interactive/glc2000_vgt_1280x1024.html); Global Forest Resources Assessment (FRA 2000 and FRA 2005, see FAO 2006): http://www.fao.org/forestry/en/ and http://www.fao.org/forestry/site/fra/en/; as well as local data sets.

[21] Global Lakes and Wetlands Database (GLWD): http://www.wwfus.org/science/data.cfm

[22] Global Cultivation Intensity Map (GCIM) from the NASA: http://data.giss.nasa.gov/landuse/cultint.html

Land-cover maps – combined on a regional, national or even sub-national scale within ecological meaningful units (e.g., Ecoregions) as well as existing data, knowledge of local stakeholders and, if necessary, collecting new data – are the base for the identification of HNCV areas which are not yet covered in the above mentioned databases.

Overviews on different approaches and systems to classify land-cover and land-use change by remote sensing are given in Strand et al. (2007), Kniivila (2004) and NRC (2002). Most global approaches use data available with a high temporal resolution of e.g., 1 day, but low spatial resolution of e.g., 1 km^2. Examples are Global Land Cover-2000 (SPOT Vegetation), MODIS Land Cover as well as the Human Influence Index (HII).

For the Global Land Cover 2000 (GLC2000) data-set, however, an update with a spatial resolution of 300 m based on data from 2007 will become available in March 2008 from FAO[23]. For many regions in the world, local land-cover maps are available with even a higher spatial resolution (e.g., FAO data for selected countries).

Coarser data may be useful for a global screening, but for the identification of HNCV and for the monitoring of land-cover changes on a local scale, reliable results can only be obtained with high resolution data sets (60 m or more).

Independently from the choice of data – and especially with respect of the generation of new data – it is necessary to select a classification scheme within the certification system that is applicable worldwide and that can be specified regarding local requirements. The hierarchical Land Cover Classification System (LCCS)[24] is a suitable example.

2.2.2 Decision Process

The next three steps within the proposed framework to address the protection of biodiversity are strongly influenced by decision making.

This starts from the definition of HNCV and ends with the decision which precise indicators are used to indentify HNCV. Criteria to define and to identify HNCV must be applicable globally, and should follow a hierarchical system.

Moreover, they should be very conservative due to the current missing of a sufficient Protected Area network as well as the absence of area-wide management system of landscapes respecting sustainability criteria for biodiversity (see Section 1.1).

Scientific arguments can and will support the decision process, but each decision will be partly subjective and politically motivated.

[23] John Latham, FAO, personal communication, Jan. 18, 2008

[24] Land Cover Classification System (LCCS): http://www.fao.org/DOCREP/003/X0596E/X0596E00.htm

However, the set of GIS-data described in Section 2.2.1 may provide a sound basis to identify HNCV, to propose new PA, and to decide on buffer zones (see Box 2).

As a result of this process, "no go" areas (where industrial biomass production is excluded), and areas of potential but restricted biomass production will be known, so that the remaining areas with a potential for biomass cultivation in a given region or country are known as well[25].

Box 2: The Need of Buffer Zones Surrounding Protected Areas and HNCV

The occurrence of negative impacts from surrounding areas such as cropland on Protected Areas and HNCV is well known. In consequence, in several protection concepts buffer zones are considered surrounding the area that should be protected. However, the depth of edge influence – or so-called edge effects – can strongly differ between habitats, their surrounding, edge structures, etc.

For forests – the most frequent study object for edge effects during the last decades – most edge effects vary between 20-60m (Baker/Dillon 2000, Laurenace et al. 2002, Ries et al. 2004). But also edge effects that enter several kilometres into forests are described such as fire (Cochrane/Laurance 2002). Therefore, it is strongly recommended to decide for each type of protected area or HNCV within a geographic unit – such as an Ecoregion - how wide a buffer zone should be, and which activity could be allowed within a buffer zone.

However, defining a reasonable width of buffer zones is not simple, and should be carried out on a national or sub-national level involving knowledge from local stakeholders. If a width of a buffer zone is agreed upon, it is rather easy to calculate its geographical location with GIS tools.

25 Note that remote sensing could also be used to monitor the areas, and – hence - check compliance of biomass growers with PA and HNCV area.

2.3 Recommendations and Restrictions for Cultivation to Favour Biodiversity and Agrobiodiversity

With respect to cultivation of biomass on the industrial scale, biodiversity and agrobiodiversity are – among others like water, soil, fertilizer and agrochemicals – to be addressed within a sustainable production. Similar to the framework to identify biodiversity-relevant areas outlined in Section 2.2, we propose a framework to address biodiversity and agrobiodiversity in cultivated areas that follows the same logic (see Figure 2-3). A comprehensive **GIS database** for cultivation purposes may consider country's frontiers, Agro-Environmental Zones[26] and Suitability Categories for Agriculture[27] as well as land-use maps[28]. Unfortunately, in most regions of the world, data on land-use are only available with a coarse resolution that is insufficient for a local application. However, an in-depth analysis of usable data basis for agricultural purposes is out of the scope of this paper.

In general, cultivation bears a high potential to negatively affect biodiversity as well as agrobiodiversity (see Section 1.1), and the risks of negative impacts should be reduced within the **decision process** (Figure 2-3). In a first step we propose to figure out for each PA and HNCV mapped within the framework to identify biodiversity-relevant areas (see Section 2.2 and Figure 2-2) a set of cultivation practices that will not endanger biodiversity of these areas.

In this context especially land-use practices within buffer zones around PA and HNCV must be addressed to avoid negative cultivation effects from neighbouring sites (compare Box 2). Such cultivation practices, however, will strongly depend on Agro-Environmental Zones as well as on site conditions.

The latter is also the case for the selection of priority farming systems – including a sound landscape planning (compare Chapter 1.1 and 2.2.2). On the one hand cultivation in the matrix should allow connectivity (corridors, step stones) between PA and HNCV, on the other hand cultivated areas should harbour as much biodiversity as possible.

In parallel – and especially in the case that in a country no reliable land-use policy exists sufficiently addressing the protection of biodiversity and agrobiodiversity – areas should be identified which can be used for biomass production with low risks to endanger biodiversity (e.g. degraded areas).

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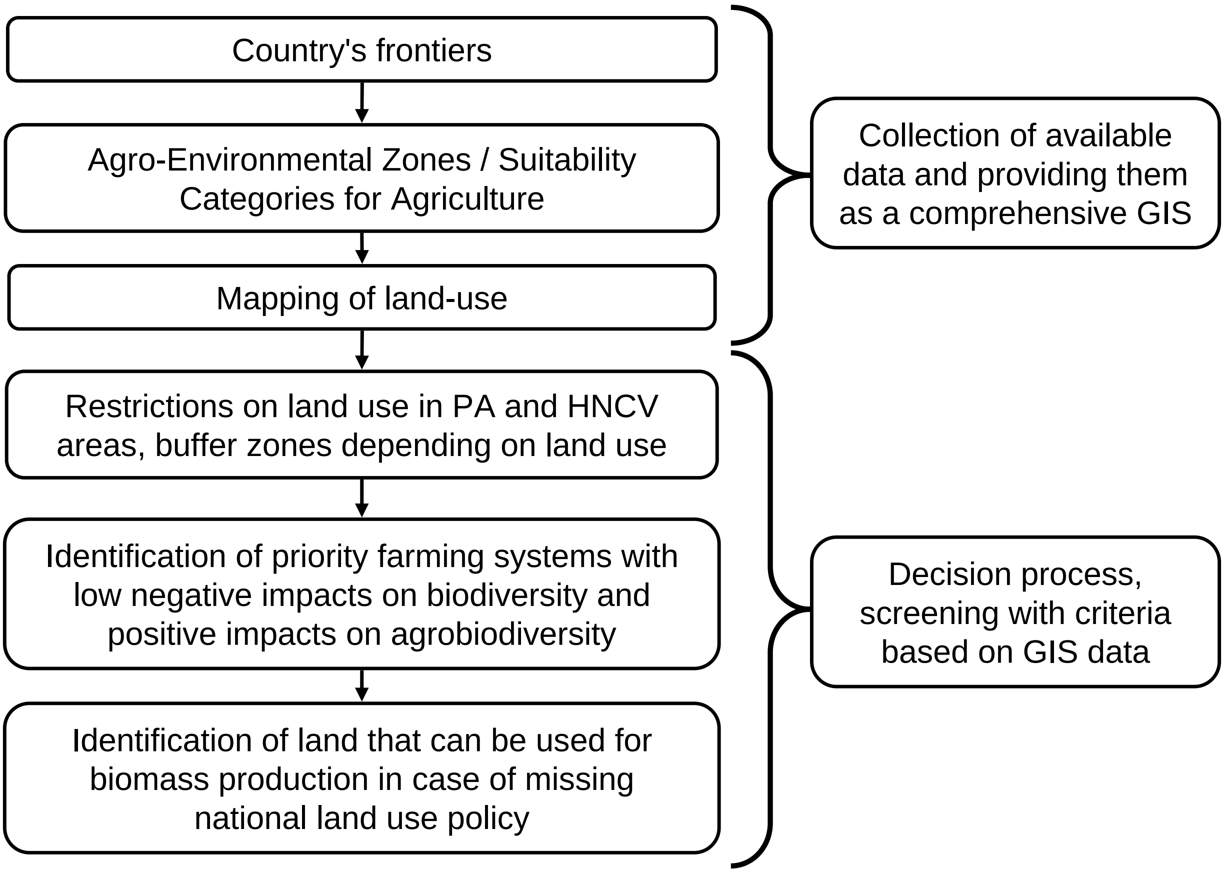
26 Agro-Environmental Zones (e.g., FAO 2005): http://www.fao.org/ag/agl/agll/prtaez.stm and http://www.geo.ucl.ac.be/LUCC/lucc.html

27 FAO and IIASA (unpublished data). According to Mirella Salvatore (FAO) the report including these data will be available end of February 2008.

28 For example, FAO data: Agro-MAPS (http://www.fao.org/landandwater/agll/agromaps/interactive/page.jspx); Data and Information center of LADA: (http://lada.virtualcentre.org/pagedisplay/search.asp?section=tsearch)

Figure 2-3: Framework for Cultivated Areas.



Source: Öko-Institut

3 Open Questions and Further Work

3.1 Definition of HNCV and description of its indicators

- What is an internationally acceptable and applicable definition of HNV?
- What are indicators for HNCV meaningful on local scales?

In March, 2008, the “expert meeting on biodiversity standards and strategies for the sustainable cultivation of biomass for non-food purposes” (BfN Vilm) will offer the opportunity to discuss this question within an international forum.

In addition, further literature research and consultation of related projects will be carried out, and a further international expert workshop later in 2008 is considered in collaboration with EEA, and FAO/UNEP.

3.2 Classification and Inventory

- Which database should be considered in a proposed GIS?
- How can the provided information be used by relevant actors?
- How to incorporate small-scale farming in a monitoring scheme, i.e. on a scale below mapping resolution of remote sensing?

Based on the current status of the approach presented here, the project will carry out an in-depth review on relevant data sets, give recommendations for their use concerning biodiversity, refine the presented framework for biodiversity-relevant areas and cultivation areas, as well as implement the data sets of priority in a GIS.

Cooperation with EEA and FAO will be sought, as well as exchange of information with IIASA, and JRC-Ispra.

3.3 Cultivation Practices

- What are biodiversity-relevant indicators for farming systems with low negative impacts on biodiversity and agrobiodiversity?
- Which negative effects may occur on neighbouring PA and HNCV (buffer zone, etc.)?
- What are – from a biodiversity point of view – priority framing systems for major bioenergy crops/biomass crops?

For major bioenergy crops/biomass crops also considered in the other areas of this project, exemplarily cultivation variants with low negative impact on biodiversity and agrobiodiversity in the cultivated area as well as effects on neighbouring PA and HNCV will be evaluated.

Here, results from the BMU project “sustainable biogas”, and ongoing BfN projects will be included.

3.4 Pilot Applications, Institutions and Decision Makers

- Will the scheme work in practice?
- Which are reliable institutions/mechanisms to identify HNV in countries and ecoregions?
- Which institutions can define land-use compatible with PA and HNV?

To test the suggested approach, the project will seek support for a pilot application of GIS-supported mapping and screening in a given country. In that respect, collaboration with FAO is currently arranged.

In addition, the development of potential monitoring schemes based on remote sensing (via satellites) should be considered.

For both, further collaboration with (pilot) certification and private sector activities will be explored.

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Glossary

Abandoned farmland refers to unused areas within a cultural landscape where former agricultural activities have been given up (Schäfer 1992).

Agriculture comprises every systematic cultivation form of soil by crop crowing or creating of grassland for animal production (Schäfer 1992).

Agricultural biodiversity, sometimes called '**agrobiodiversity**', encompasses the variety and variability of animals, plants and micro-organisms which are necessary to sustain key functions of the agro-ecosystem, its structure and processes for, and in support of, food production and food security (FAO/CBD, Workshop 1998[29]). The term agro-biodiversity encompasses within-species, species and ecosystem diversity.[30]

Areas of high nature conservation value (HNCV) are not jet clearly defined. A definition should comprise but not exclusively high nature value farmland and high conservation value forests (see definitions below). The definition given within the BSO can be seen as a promising attempt to find a comprehensive definition (see Box 1).

Biological diversity (=biodiversity) means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD, article 2).[31]

Cultivated and Managed Terrestrial Areas refers to areas where the natural vegetation has been removed or modified and replaced by other types of vegetative cover of anthropogenic origin. This vegetation is artificial and requires human activities to maintain it in the long term. All vegetation that is planted or cultivated with an intent to harvest is included (e.g., wheat fields, orchards, rubber and teak plantations).[32]

Degraded land comprises former suitable (used) land that has been turned in unsuitable land by a degradation process that is not any more used for agriculture and other (land associated) human activities (Oldemann et al. 1991). Degraded land still has the potential to be restored by adequate measures.

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[29] See http://iufro-archive.boku.ac.at/silvavoc/glossary/2_1en.html and further definitions on this web-site.

[30] EEA Glossary: http://glossary.eea.europa.eu/EEAGlossary/A/agrobiodiversity

[31] http://www.cbd.int/convention/articles.shtml?a=cbd-02

[32] http://www.fao.org/DOCREP/003/X0596E/x0596e01f.htm#p381_40252

Ecoregions are relative large units of land containing a distinct assemblage of natural communities and species, with boundaries that approximate the original extent of natural communities prior to major land-use change.

Ecosystem means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.[33]

Fallow within the agricultural sector describe the interruption cultivation for one or several vegetation periods to achieve a refreshment/improvement of soil fertility (Schäfer 1992, see also abandoned farmland and shifting cultivation).

Forestry is the art, science, and practice of studying and managing forests and plantations, and related natural resources. Modern forestry generally concerns itself with: assisting forests to provide timber as raw material for wood products; wildlife habitat; natural water quality regulation; recreation; landscape and community protection; employment; aesthetically appealing landscapes; biodiversity management; watershed management; and a 'sink' for atmospheric carbon dioxide.[34]

Grassland refers to vegetation types characterised by a dominant and continuous grass layer and no or a low cover of trees and shrubs. Grassland comprises steppes, some savanna types, arid grassland as well as meadow and pasture (Schäfer 1992).

High nature value farmland comprises the core areas of biological diversity in agricultural landscapes. They are often characterised by extensive farming practices, associated with a high species and habitat diversity or the presence of species of conservation concern (EEA 2005).

High Conservation Value Forests (HCVF) are those that possess one or more of the following attributes: (1) Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia). (2) Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance. (3) Forest areas that are in or contain rare, threatened or endangered ecosystems. (4) Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control). (5) Forest areas fundamental to meeting basic needs of local communities (e.g.subsistence, health). (6) Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities) (FSC 2000).

33 Article 2 of the Convention on Biological Diversity , see http://www.cbd.int/ecosystem/description.shtml

34 http://en.wikipedia.org/wiki/Forestry

Land use is series operation on land, carried out by humans, with the intention to obtain products and/or benefits through using land resources (de Bie 2002).

Marginal land is defined as an area where a cost-effective production is not possible, under given side conditions (e.g. soil productivity), cultivation techniques, agriculture policies as well as macro economic and legal conditions (Schroers 2006).

Natural vegetation is defined as areas where the vegetative cover is in balance with the abiotic and biotic forces of its biotope.[35]

Protected areas are defined by the IUCN as “an area of land and/or sea especially dedicated to the protection and maintenance of biodiversity, and of natural and associated cultural resources, and managed through legal or other effective means”. This definition is similar to the one adopted by the Convention on Biological Diversity (CBD), which defines a protected area as “a geographically defined area that is designated or regulated and managed to achieve specific conservation objectives” (Dudley and Phillips 2006).

Shifting cultivation is an agricultural system in which plots of land are cultivated temporarily, and then abandoned. This system often involves clearing of a piece of land followed by several years of wood harvesting or farming until the soil loses fertility. Once the land becomes inadequate for crop production, it is left to be reclaimed by natural vegetation, or sometimes converted to a different long term cyclical farming practice.[36]

Semi-natural vegetation is defined as vegetation not planted by humans but influenced by human actions. It includes vegetation due to human influences but which has recovered to such an extent that species composition and environmental and ecological processes are indistinguishable from, or in a process of achieving, its undisturbed state. These may result from grazing; possibly overgrazing the natural phytocenoses, or else from practices such as selective logging in a natural forest whereby the floristic composition has been changed. Other examples are previously cultivated areas which have been abandoned and where vegetation is regenerating as well as secondary vegetation developing during the fallow period of shifting cultivation.[37]

Sustainable use means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby

[35] http://www.fao.org/DOCREP/003/X0596E/x0596e01f.htm#p381_40252

[36] http://en.wikipedia.org/wiki/Shifting_cultivation

[37] http://www.fao.org/DOCREP/003/X0596E/x0596e01f.htm#p381_40252

maintaining its potential to meet the needs and aspirations of present and future generations (CBD, article 2).[38].

Used land and unused land refer more to a gradual change from intensely used land towards land that is not influenced by any land-use form. Agriculture and forestry (see definition above) as well as infrastructure can clearly be considered as **used land** to meet humans needs (food, fodder, fibre, and infrastructure), whereas for extensive land-use forms (e.g. collection of medicinal plants or sporadic hunting) it is difficult to decide up to which use-intensity land is still considered as unused land. The terms unused land and **idle land** can be used synonymously. **Unused land** comprises abandoned farmland, degraded, devastated and waste land as well as areas of undisturbed wildlife.

Waste land is characterised by natural physical and biological conditions that are per see unfavourable for (land associated) human activities (Oldemann et al. 1991).

38 http://www.cbd.int/convention/articles.shtml?a=cbd-02

Abbreviations

AZE	Alliance for Zero Extinction
BioKraftQuG	German Biofuel Quota Law
BSO	Biofuels Sustainability Ordinance (Verordnung über Anforderungen an eine nachhaltige Erzeugung von Biomasse zur Verwendung als Biokraftstoff, BioNachV)
CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
EEG	Renewable Energy Sources Act (Erneuerbare Energien-Gesetz)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRA	Global Forest Resources Assessment (FRA 2000 and FRA 2005)
FSC	Forest Stewardship Council
GIS	Geographical information system (with digital spatial database)
GLC 2000	The Global Land Cover 2000
HNVC	Area of High Nature Conservation Value
IUCN	International Union for the Conservation of Nature and Natural Resources
NGO	Non-governmental organization
OEKO	Öko-Institut (Institute for applied Ecology)
PA	Protected Area
PoWPA	Programme of Work on Protected Areas
UBA	German Federal Environment Agency (Umweltbundesamt)
WCMC	UN World Conservation Monitoring Centre