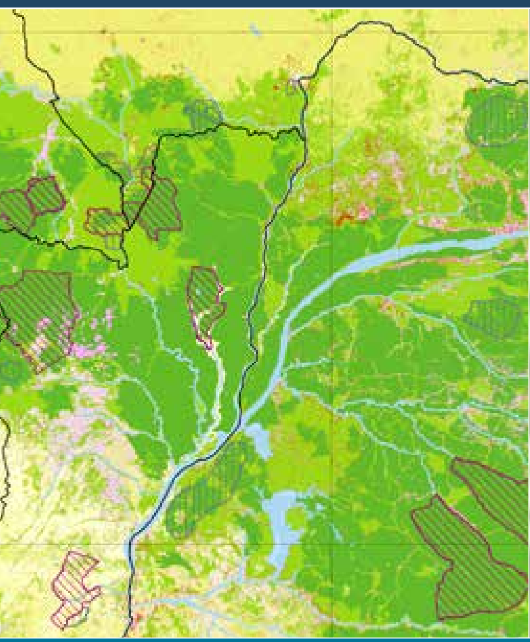
Synergies between REDD+ and the Aichi Biodiversity Targets in Central Africa

How spatial analysis can support the planning of forest policies for climate and biodiversity objectives



REDD pac

COMMISSION DES FORETS D'AFRIQUE CENTRALE
COMIFAC

UNEP

UNEP World Conservation Monitoring Centre
219 Huntingdon Road
Cambridge, CB3 0DL
United Kingdom
Tel: +44 (0) 1223 277314
Fax: +44 (0) 1223 277136
Email: info@unep-wcmc.org
Website: www.unep-wcmc.org

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ACKNOWLEDGEMENTS
This report was produced by UNEP World Conservation Monitoring Centre (UNEP-WCMC), under the REDD-PAC project. This project is supported by the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, based on a decision of the German Bundestag. Many thanks go to all those who contributed to this report: Agnes Hallosserie, Tania Salvaterra and Stephen Woroniecki for supporting publishing, Alain Karsenty and Aline Mosnier for their comments and Chouaibou Nchoutpouen, Peguy Tonga and all the participants in the workshop held in Douala in collaboration with the CBD Secretariat in July 2014.

CONTRIBUTORS
Blaise Bodin, Corinna Ravilious, Carole Bastianelli and Rebecca Mant.

UNEP World Conservation Monitoring Centre
219 Huntingdon Road, Cambridge, CB3 0DL, UK
E-mail: info@unep-wcmc.org

CITATION
Bodin B., Ravilious C., Bastianelli, C., Mant. R. (2014) Synergies between REDD+ and the Aichi Biodiversity targets in Central Africa - How spatial analysis can support the planning of forest policies for climate and biodiversity objectives. UNEP-WCMC, Cambridge, UK.

Available online at:
http://wcmc.io/redd-aichi-comifac-english

Printed in the UK by Langham Press (an ISO 14001 accredited printing company)

Photos:
Cover: Left: Map of deforestation in protected areas, UNEP-WCMC. Right: Luikuala © Terah U. Dejong. Centre: Grey Parrot, a flagship species of the subregion © Fedor Selivanov / Shutterstock
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How spatial analysis can support the planning of forest policies for climate and biodiversity objectives

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Forest on the slopes of Mount Cameroon © Blaise Bodin

1. Introduction: the potential for synergies between REDD+ and the Aichi Biodiversity Targets

Climate change and loss of biodiversity are two of the main challenges facing populations and ecosystems at the global level. Deforestation and degradation of forests are significant contributors to anthropogenic climate change. Overall, changes in land use - including deforestation and degradation - make a net contribution of about 10% to global emissions of greenhouse gases (IPCC Working Group 1 2013). Land use change, through the conversion of natural ecosystems (e.g. into agricultural or built areas) is also a crucial factor in the loss or fragmentation of natural habitats, and hence to loss of biodiversity. Two global-level policy commitments have been designed to respond to these issues: the emerging mechanism for Reducing Emissions from Deforestation and forest Degradation, plus the conservation of forest carbon stocks, sustainable management of forests and enhancement of forest carbon (REDD+) and the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets (hereinafter 'Aichi Targets'), adopted under the auspices of the Convention on Biological Diversity (CBD). The aim of this report is to explore the links between the implementation at the national and regional levels of these two international commitments.

The objective of REDD+, as negotiated within the United Nations Framework Convention on Climate Change (UNFCCC), is to support policy approaches for climate change mitigation through the reduction of greenhouse gas emissions and increasing carbon uptake by forests. The Parties to the UNFCCC are currently discussing the exact form of the financial mechanism to encourage these policy approaches in the long term. In the meantime, many developing countries have already entered a phase of "REDD+ readiness", aimed at building their capacity to participate in the mechanism.

The main aims of the Convention on Biological Diversity (CBD), adopted in 1992, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. The Strategic Plan for 2011-2020, adopted by the parties to the CBD in October 2010, divides these three major principles into five strategic goals and 20 targets. These are global objectives but they are implemented mainly at national, sub-national and local level. The targets are adapted mainly at national level through National Biodiversity Strategies and Action Plans (NBSAP) drawn up by the parties to the CBD.

The countries of the Congo Basin have adopted a joint position in negotiations over REDD+, and have attracted significant REDD+ readiness funding since then (see Annex V). In 2005 the Central African Forest Commission (COMIFAC) was created and initiated a "Convergence plan for sustainable management of the environment and forest ecosystems of Central Africa". This plan, revised in 2014, promotes the adoption of policies for sustainable management of forests in the sub-region.

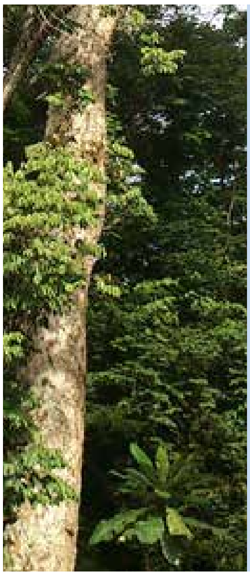
The Commission for Central African Forests (COMIFAC)

The dense rainforests of Central Africa, covering nearly 204 million hectares are one of the three major tropical forest basins on the planet. These forests are spread across ten countries: Burundi, Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic, Democratic Republic of Congo, Rwanda, São Tomé & Principe and Chad. Since its inception through the Yaoundé Declaration of March 1999, the COMIFAC is the organisation of reference for political and technical guidance, coordination, harmonization and decision-making in the conservation and sustainable management of forest and savannah ecosystems in Central Africa. The COMIFAC has developed and adopted in February 2005 a Convergence Plan for the improved management and conservation of forests in Central Africa. This Convergence Plan was revised in 2014 and, at the time of writing, is waiting for final approval by the Council of the Ministers of Environment.

Key numbers on the Congo Basin:

- 100 million inhabitants
- 204 million hectares of dense humid forest (46% of overall forested area in the region)
- 12 million cubic meters of timber produced every year;
- 400 species of mammals;
- 1300 species of birds;
- 336 species of amphibians;
- 400 species of reptiles;
- 20 000 recorded species of plants, of which 8000 are endemic.

Source: http://www.comifac.org



The REDD-PAC Project

This report is produced through the REDD-PAC project. The REDD-PAC project aims to support the identification of efficient and socially responsible REDD+ policies to safeguard and enhance ecosystems and assist in achieving the objectives of the Convention on Biological Diversity. It is financed by the German Federal Ministry of the Environment, Nature Conservation, Building and Nuclear Safety, through its International Climate Initiative. The main component of the project is land use change modelling, in Brazil and the Congo Basin (COMIFAC countries), to assess the impact of different land use policies scenarios (including REDD+) and their respective impacts on CO_2 emissions, forest cover, biodiversity and economic development. The maps and analyses presented are constructed on the basis of present or past data, and not on the spatially explicit projections that the model should produce as its end result. They provide an introduction to the assessment of the potential impacts of REDD+ on biodiversity and ecosystem services that will be part of the modelling.

For more information visit www.redd-pac.org

COMIFAC countries are all parties to the CBD and have developed NBSAPs. A process of revision of these NBSAPs has been underway since 2010 in order to incorporate the Aichi Targets. The Convergence Plan from COMIFAC also provides a reference framework at the sub-regional level for such a revision.

The sustainable management of forest is only one facet of the aspiration of COMIFAC countries to a stronger governance and economic growth. This ambition to become “emergent economies” is reflected in the proliferation of national plans for development and poverty reduction.[1] These ambitions create a specific context for the implementation of REDD+ and the development of NBSAPs. These policies need to fit within an already busy political agenda and national planning processes, especially in relation to land use. However, these agendas do not need to be in conflict: the implementation of REDD+ and the Aichi Targets can indeed support the development of a “green economy”, a notion embraced by many of the national development plans in the sub-region. A green economy is a low-carbon economy which makes efficient use of resources and is socially inclusive. The evolving concept advocates a low-carbon development that takes into account the social and environmental dimensions of development and regards natural resources as sources of wealth, job creation and prosperity (Sukhdev *et al.* 2012).

REDD+ presents many potential opportunities for benefits to biodiversity, ecosystem services and the green economy, however, there are also potential risks. One example of such a risk is that limiting the conversion of forests into agricultural land without dealing with the factors driving that conversion could shift these pressures towards other ecosystems of importance for biodiversity, such as natural savannah. The potential benefits and risks from REDD+ are recognised and adressed through seven safeguards, adopted by the Conference of the Parties of the UNFCCC in Cancún in 2010 (see box). These safeguards must be “promoted and supported” by countries in their implementation of REDD+ (UNFCC Decision 1/CP..16). At the Conference of the Parties in Warsaw in 2013, the Parties to the UNFCCC also decided that countries should provide a summary of how these safeguards are “addressed and respected” before receiving REDD+ payments (UNFCCC Decision 9/CP.19).

If implemented in line with the Cancún safeguards, REDD+ activities could in many cases contribute to progress towards the objectives of the CBD. The CBD has recognized this potential for REDD+ to contribute to its implementation (Von Scheliha 2009, SCDB 2011). For example REDD+ activities aimed at reducing deforestation present obvious synergies with Aichi Target 5 on “the reduction in the loss of natural habitat, including forest”, and vice-versa. Other synergies are less obvious and will depend on the design and location of the REDD+ action. The table presented on the next spread (Table 1) illustrates how the Aichi Targets can relate to a set of REDD+ actions.

This overlap is not complete. For example, at present there is no link between the implementation of REDD+ and the third objective of the CBD on “access and far and equitable sharing of genetic resources” (and associated Aichi Target 16). The access to and sharing of resources (including financial) that should result from REDD+ is an important issue, but distinct from that of genetic resources.

The potential for REDD+ actions to support the achievement of Aichi targets depends on the approach adopted, but also to a large extent on the location where the action is implemented. This report therefore aims to explore to what extent spatial analysis can support the joint planning of

[1] Notably DRC: Document de la Stratégie de la Croissance et de la Réduction de la Pauvreté II (2012) ; Congo: Document de stratégie pour la réduction de la pauvreté (2008) ; Cameroun : Vision Cameroun 2035 (2009)

the implementation of these two international commitments. The possible methodologies for such analysis are presented and discussed using data on the sub-region (**Section 2**). The contribution of spatial analysis is then explored in more detail for three major types of REDD+ actions which are found in most of the Readiness Preparation Proposals (R-PP) from COMIFAC countries. The term "REDD+ action" is here understood as any type of policy and its implementation which contributes to the reduction of deforestation and forest degradation, or to enhancing forest carbon stocks, thus reducing emissions from forests as measured at the national or jurisdictional level.

Since it was not possible to provide examples of spatial analysis for all the planned REDD+ actions as part of this study, priority was given to those with the greatest links to the CBD targets: REDD+ actions for the conservation of forests (**Section 3**), REDD+ actions for the sustainable management of forests (**Section 4**), and REDD+ actions aimed at reforestation and forest restoration (**Section 5**). In all three cases, the synergies between the actions and certain Aichi Targets could be enhanced through spatial analysis and planning.

The majority of Congo Basin countries are currently in the process of revising their NBSAPs. With the exception of Cameroon, the revised NBSAPs have not yet been submitted and could therefore incorporate points relating to potential synergies with REDD+ and relevant spatial data in this respect. Additionally, Congo Basin countries are at various stages in developing their REDD+ policies, from adopting a national framework strategy and an investment plan (Democratic Republic of Congo) to developing Readiness Preparation Proposals (R-PP) (São Tomé, Burundi), and could therefore incorporate points related to potential synergies with the CBD.

Whilst COMIFAC countries are updating their NBSAPs and drafting or refining their REDD+ strategies, this type of analysis could thus be useful for the consideration of:

- multiple benefits linked to biodiversity and ecosystem services of forests in developing national and sub-regional REDD+ strategies, in line with the Cancún Safeguards;
- the potential for synergies with REDD+ in the National Biodiversity Strategy and Action Plans (NBSAP), and Protected Areas action plans, which must now take into account the risks and opportunities represented by REDD+;
- REDD+ and the potential for synergies with the CBD in sub-regional plans such as the COMIFAC Convergence Plan.

The Cancún safeguards (Decision UNFCCC 1/CP.16)

When undertaking the REDD+ activities, the following safeguards should be promoted and supported:

a) That actions complement or are consistent with the objectives of national forest programmes and relevant international conventions and agreements;

b) Transparent and effective national forest governance structures, taking into account national legislation and sovereignty;

c) Respect for the knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples;

d) The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities, in the actions referred to in paragraphs 70 and 72 of this decision;

e) That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions referred to in paragraph 70 of this decision are not used for the conversion of natural forests, 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;

f) Actions to address the risks of reversals;

g) Actions to reduce displacement of emissions.

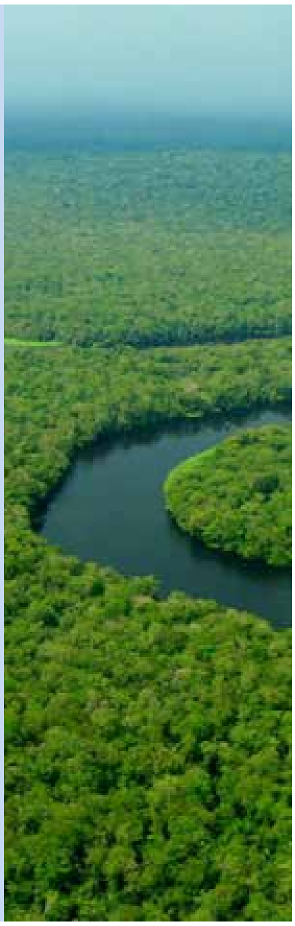


Table 1. Overlaps between Aichi Targets and some REDD+ actions

Relevance of REDD+ Actions for the implementation of Aichi Targets

NB: The objectives mentioned here are those that are discussed in this report. There may be other relevant targets for the actions concerned.

●: complete overlap ○ : overlap depends on the approach adopted

Strategic Goal	Target	REDD+ actions for forest conservation	REDD+ actions for sustainable management	REDD+ actions for reforestation
Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society	**Target 2** By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	○	○	○
Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use	**Target 5** By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	●		
	Target 7 By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.		●	
	Target 9 By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.			○
Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity	**Target 11** By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	○		
	Target 12 By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	○	○	○
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services	**Target 14** By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, 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 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	○		●

2. How spatial analysis can support joint planning for the implementation of REDD+ and Aichi Targets

Changes in land use, and more specifically the conversion of natural forest land to productive uses (such as agriculture or mining), represent one of the main drivers of the loss of biodiversity and a significant source of greenhouse gas emissions. Policies on land use and associated spatial data are therefore highly relevant for the implementation of both REDD+ and the Aichi Biodiversity Targets. Representing in a spatially explicit manner the variables relevant for planning the implementation of these two international commitments can help to obtain an overall view of the challenges and opportunities for linking them. Spatial analysis may enable a better understanding of the synergies and trade-offs related to complex decisions on land use, reduce uncertainty and support the process of planning and zoning of land. Carrying out such an analysis requires gathering information related to potential emissions from the forest sector (2.1), as well as to conservation and use of biodiversity (2.2). This information can then be combined to produce maps to analyse possible synergies between the two goals (2.3).

2.1 Relevant variables for the spatial analysis of potential emissions in the forest sector

Once a fully-functioning REDD+ mechanism is in place, performance and any associated results-based payments are likely to be estimated based on emission reductions in the forest sector (carbon flows) in relation to an agreed reference level[2]. This carbon flow is distinct from the notion of carbon stocks, and depends on two factors: changes in land use or utilisation of a given forest area, and its carbon density. Certain areas are exposed to very severe conversion pressures but have a low-carbon density; therefore, the emissions resulting from their conversion will be relatively low per unit area (e.g. ha) impacted. By contrast, other areas are under relatively little threat but have a very high carbon density in forest biomass such that even a limited conversion could cause substantial carbon emissions. Hence, information is needed regarding both pressures on the forest and carbon density in order to identify areas suitable for the implementation of actions to reduce deforestation and degradation.

Information on density of biomass is available from pan-tropical datasets such as Baccini *et al.* (2012) (see Annex II for more details). They reveal the major regional spatial variations in biomass carbon, most of which is concentrated in dense rainforest. Superimposing spatial data on recent deforestation (Hansen 2013) gives an indication of the areas where biomass carbon stocks are under greatest pressure and may be converted or degraded in future (Map 1).

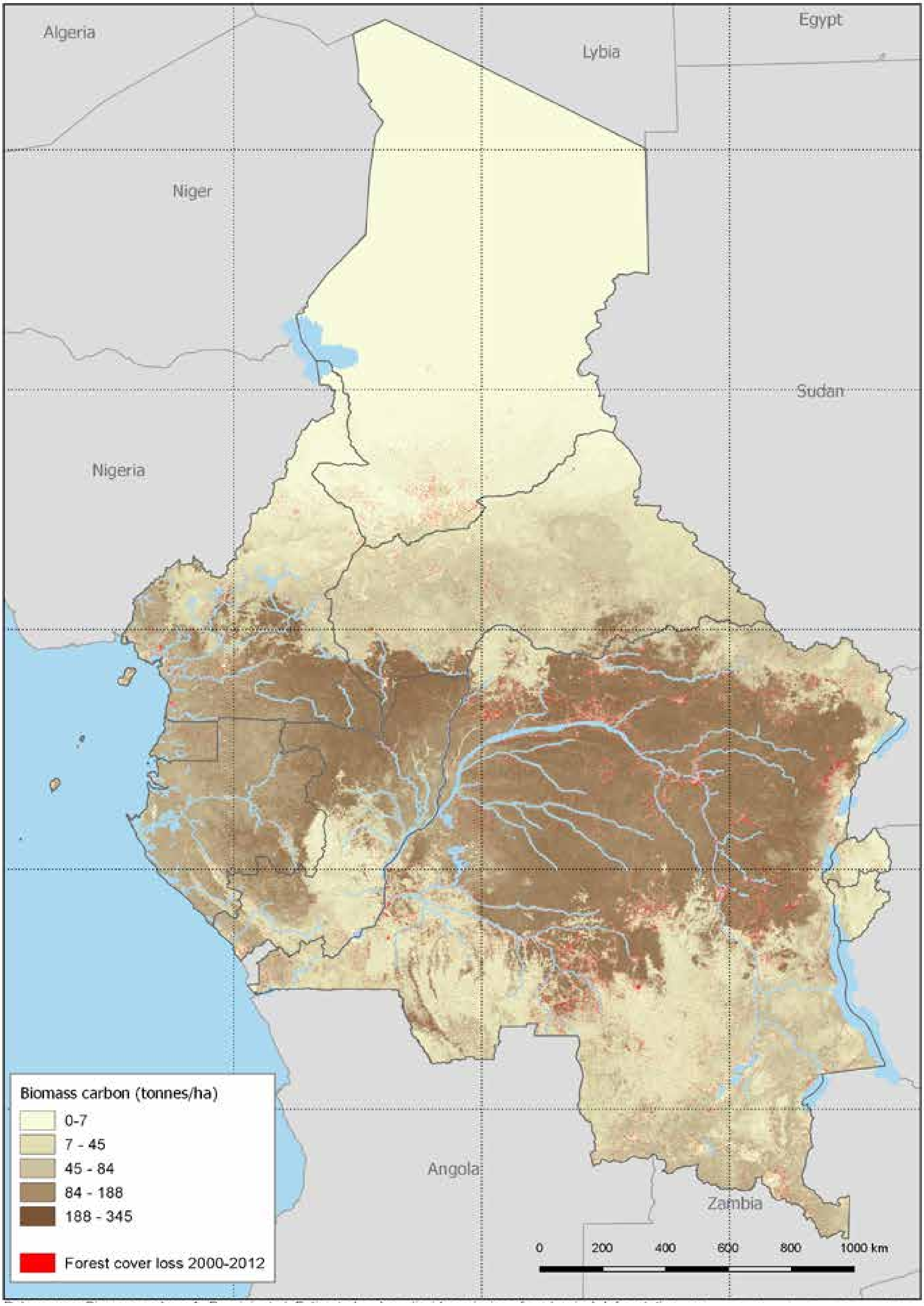
However, past data does not always predict future trends. Historic rates of deforestation in COMIFAC countries are relatively low in relation to patterns in tropical forests globally (Malhi *et al.*, 2013). However, most of these countries are only at the beginning of their forest transition, with a large share of their territory still under dense forest cover. The realisation of ambitious economic development plans, even based on sustainability principles, could therefore lead to an increase in land use change in the next decades. In turn, this increase in land use could cause an acceleration in net deforestation and degradation, which REDD+ is seeking to address.

Land use change models can enable spatially explicit projections of future land use corresponding to the implementation of different development scenarios. One example of such model is GLOBIOM, which is applied to the COMIFAC countries through the REDD-PAC project. The modelling results of this project, due in 2015, will supplement the static maps presented here, in order to assess the potential consequences of various policy options for the achievement of REDD+ and Aichi objectives.

Pirogue on the river Congo © Terah U. DeJong

[2] With the exception of the REDD+ activity "conservation of carbon stocks", for which details of implementation are still to be determined.

Map 1. Biomass carbon (aboveground and below-ground; T/ha) and recent deforestation. Combining these datasets provides an indication of where biomass carbon stocks may be at risk from current conversion pressures.



Data source: Biomass carbon: A. Baccini, et al. Estimated carbon dioxide emissions from tropical deforestation improved by carbon-density maps. 2012 Nature Climate Change, http://dx.doi.org/10.1038/NCLIMATE1354 ; Forest cover loss: Hansen, M. C., et al. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53. Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest

Map projection: Lambert Azimuthal Equal Area Projection,
latitude of origin 5 and central meridian 19
Map prepared by UNEP-WCMC.

2.2 Relevant variables for the mapping of CBD objectives

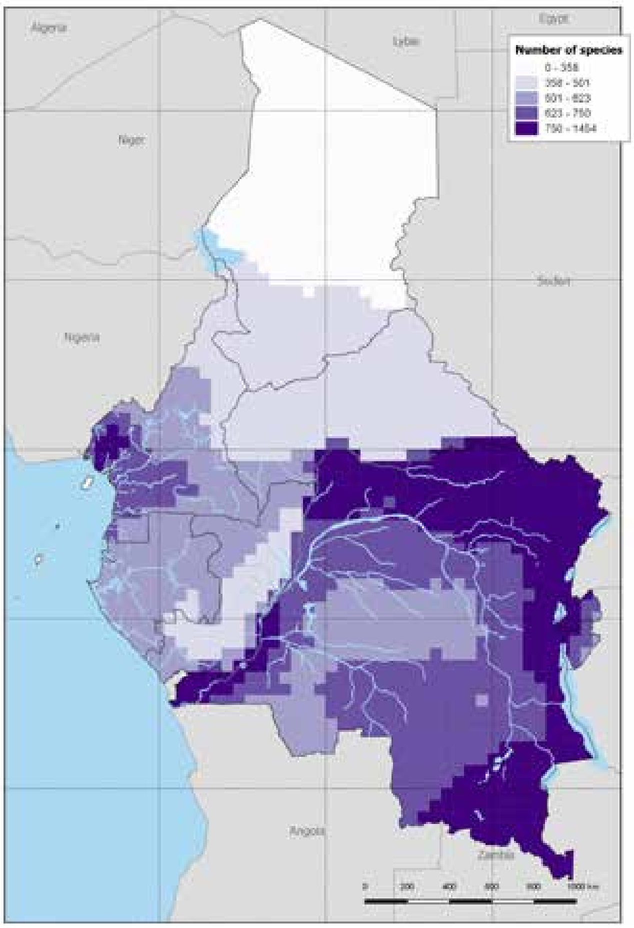
A wide range of variables are potentially relevant to spatial planning for implementation of the Aichi Targets, depending on the aspect under consideration. Relevant information includes that on potential land use change and deforestation, which can support planning for reducing loss in natural habitats (Aichi Target 5). Information on the spatial distribution of biodiversity, ecosystem services and the sustainable use of biodiversity are also relevant for Aichi Targets 12 and 14, respectively. The lack of available data in the region of the Congo Basin is a recognised problem. However, a number of data sets have been identified as part of this report which may help to determine the spatial variation of biodiversity in terms of species (Maps 2, 3 and 4), ecosystems (Map 9, Map 11), and ecosystem services (Map 5 and 6). Data on genetic diversity (relevant for Aichi Target 13) was not available on a relevant scale at the date of the study.

One of the simplest indicators of biodiversity is species richness. Geographic ranges for each species are compiled and their presence summed for a given spatial unit (see Annex I). Calculating the total species richness (for all mammals, amphibians and birds) (Map 2) gives an indication of the overall variability in numbers of species present in different locations. It is also possible to calculate the richness for a given group of species, which may be especially relevant to a given policy. For example understanding the distribution of threatened species[3] according to The IUCN Red List (Map 3) is particularly relevant for implementing Aichi Target 12 on preventing extinction of known threatened species and can help identify areas where there may be most need to protect species from anthropogenic pressures. Even on a large scale, it is possible to conclude from maps 2 and 3 that there is a high diversity of species concentrated in certain areas, particularly West Cameroon and Eastern DRC. It is also clear that there are notable differences in the patterns of richness depending on the species group being considered.

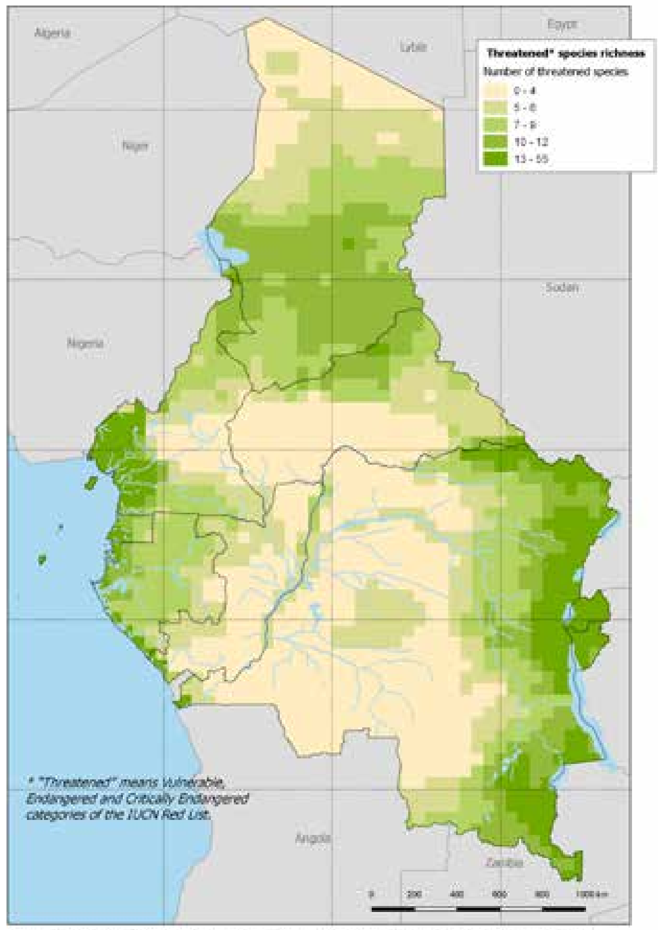
In order for spatial analysis to support decision making and policy making it is important that the species groups considered are those that are most nationally and regionally relevant. Evaluations at global level, such as The IUCN Red List, can support identification of priority species for conservation and consistent regional analysis, but will often have to be adjusted according to regional or national circumstances for

[3] Species considered here as "threatened" are the ones belonging to the categories "Vulnerable", "Endangered" and "Critically Endangered"

Map 2. Potential species richness (all species)



Map 3. Potential species richness (threatened species)



Data Source: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.01. http://www.iucnredlist.org. Spatial data provided by IUCN, February 2013.

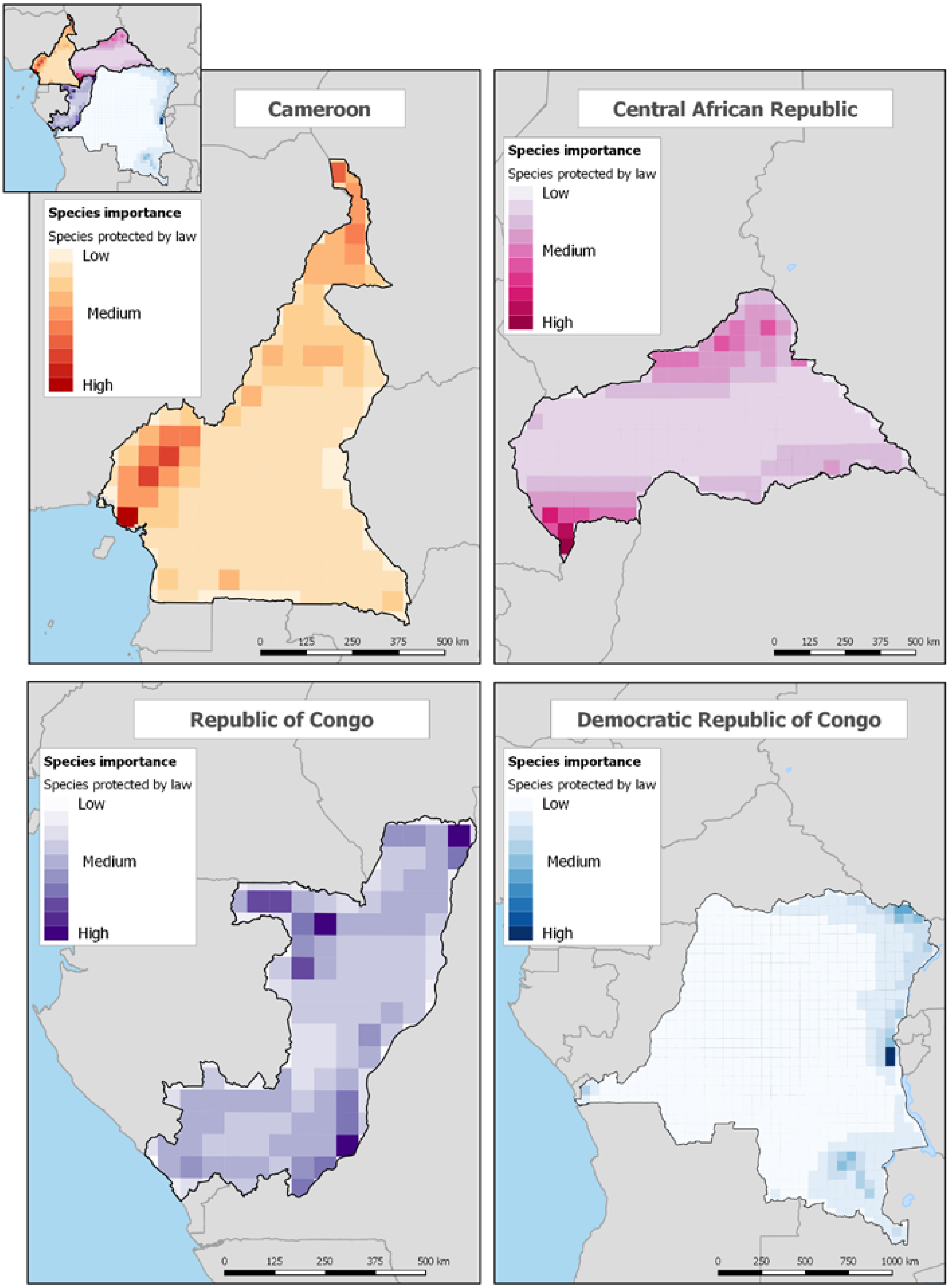
national analysis. For example, at the sub-regional level, the Convergence Plan, in its "Axis of intervention for the conservation and enhancement of biodiversity" emphasises the importance of the conservation of large mammals. Some of these large mammals are also the subject of additional regional agreements such as the Declaration of Kinshasa on Great Apes or various action plans for prohibiting the trade in ivory and the poaching of elephants (Nellemann *et al.* 2014). At the national level, it is possible to refer to legislative texts in order to identify those species that are partially or fully protected.

In Map 4, this analysis was carried out for four of the countries of the region: Cameroon, the DRC, the Republic of the Congo and the Central African Republic (the references for the legal texts used can be found in the sources at the end of the report). Understanding the distribution of legally protected species can support the identification of areas where species that are considered nationally important are concentrated. The methodology used here (described in more detail in Annex I) is different from that used in the previous maps of species richness, and combines information not only on the number of species but also on their degree of endemism to the planning unit considered. Combining the data on legally protected species with projections of future land use (as will be carried out using the land use change modelling within the REDD-PAC project), can then enable assessments of the impacts on biodiversity of different REDD+ policy scenarios with regard to national conservation goals.

Species are not the only component of biodiversity important for spatial planning for REDD+ multiple benefits and the CBD. Information on the spatial distribution and variability of ecosystems is also highly relevant, as different ecosystems can provide different ecosystems services. A number of data sets are available for evaluating the variability of ecosystems at the sub-regional level. The WWF's eco-regions (Olson et al., 2001) providesa general overview of the spatial distribution of ecosystems in the Congo Basin which are relevant on a global scale. Land cover maps such as that produced by FORAF/Catholic University of Louvain provide more detailed mapping of different forest and non-forest ecosystems, including semi-natural and artificial such as agricultural areas. These data sets are presented and discussed in more detail in Section 3.

Sangha River close to Bayanga at the Dzanga-Ndoki National Park, Central African Republic by Peter Prokosch © 2013 GRID-Arendal

Map 4. Importance index highlighting areas which are important for species fully protected under national law (Cameroon, Republic of Congo, Democratic Republic of the Congo, Central African Republic). See Annex I for details.



Data source: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.01. http://www.iucnredlist.org. Spatial data provided by IUCN, February 2013.

Map projection: Lambert Azimuthal Equal Area Projection, latitude of origin 5 and central meridian 19
Map prepared by UNEP-WCMC.

Forest fires from the sky, Democratic Republic of Congo, 2002. Traditional slash-and-burn cultivation systems are one of the most important drivers of forest cover loss in the subregion (CC BY-NC 2.0) NASA https://flic.kr/p/nKYqX5+

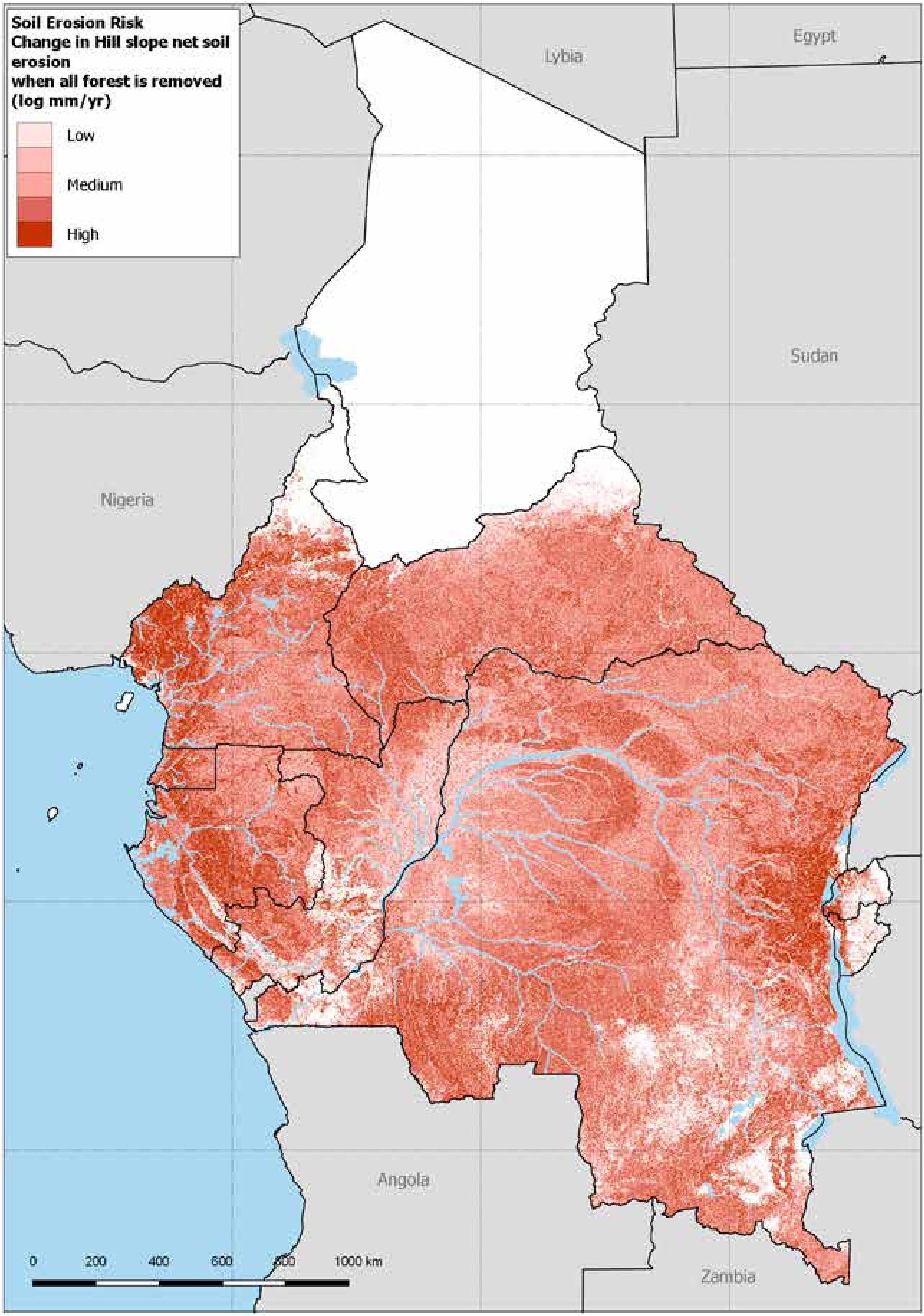
Information on the sustainable use of the components of biodiversity is highly relevant for regional ambitions to develop a green economy and reduce poverty. Taking into account the services provided by ecosystems is essential for ensuring that future plans for infrastructure and land use plans are supported by the continuous provision of major regulating services, such as the contribution of forests to local climate regulation (Akkermans *et al.* 2014) or soil formation and the control of erosion. Additionally, provisioning services, such as the supply of non-timber forest products (NTFPs) and fuel wood, make a significant contribution to the livelihoods of local people, which makes them particularly sensitive to different forms of forest management. There is limited spatial information available on the distribution of ecosystem services at the sub-regional scale. However, spatial analysis can help to identify areas where forests are particularly important for combating soil erosion, and some information is available on the distribution of NTFPs.

Forests can play an important role in water regulation (Qin *et al.* 2013) and control of soil erosion (Fu *et al.* 2011). Tools, such as *WaterWorld*, can assess the potential increase in soil erosion within different areas if the current vegetation was removed, based on a range of variables related to slope, precipitation and soil (Map 5 – more details on the methodology can be found in Annex IV). This type of evaluation is useful for determining which areas of forest offer the most benefits in terms of soil erosion control, in order to target actions to reduce deforestation where these benefits are the most needed. Increased erosion may cause sedimentation in reservoirs and damage dam turbines (Bernard *et al.* 2009), such that deforestation could pose a risk to hydroelectric power generation and place a strain on the sub-region's ambitions to develop this energy source. In order to help determining not only areas most at risk of soil erosion from forest removal but also where the erosion control service is most valuable, this analysis would need to be combined with additional information which may be available at the national level on the location of infrastructures which are particularly vulnerable to sedimentation, such as the catchment areas of hydroelectric dams.

The contribution of NTFPs, fuel wood or artisanal timber to local subsistence and to national economies in the Congo Basin is well documented (Ingram et al. 2010). Recent studies have confirmed the importance of the income that local populations derive from natural forest products (Angelsen *et al.*, 2014). However, there is very little data available for the quantification of the spatial variation of NTFP across the sub-region. Information is only available on selected species. For example, the incidence and probability of distribution of *Prunus africana* (Map 6), a tree whose bark is widely used as a medicinal product, has recently been assessed (Vinceti *et al.* 2013). In the future, gathering more of this type of data on the spatial distribution of NTFPs will help idenfitying areas of potential importance for sustainable use of biodiversity. Ideally, such assessments would be complemented by additional information on actual levels of use of these resources by local populations.

Map 5. Soil erosion risk from forest removal when all vegetation is removed in forested areas

This map highlights areas where forest protection may be particularly important for the control of soil erosion (a factor of surface runoff, degree of slope and vegetation cover)

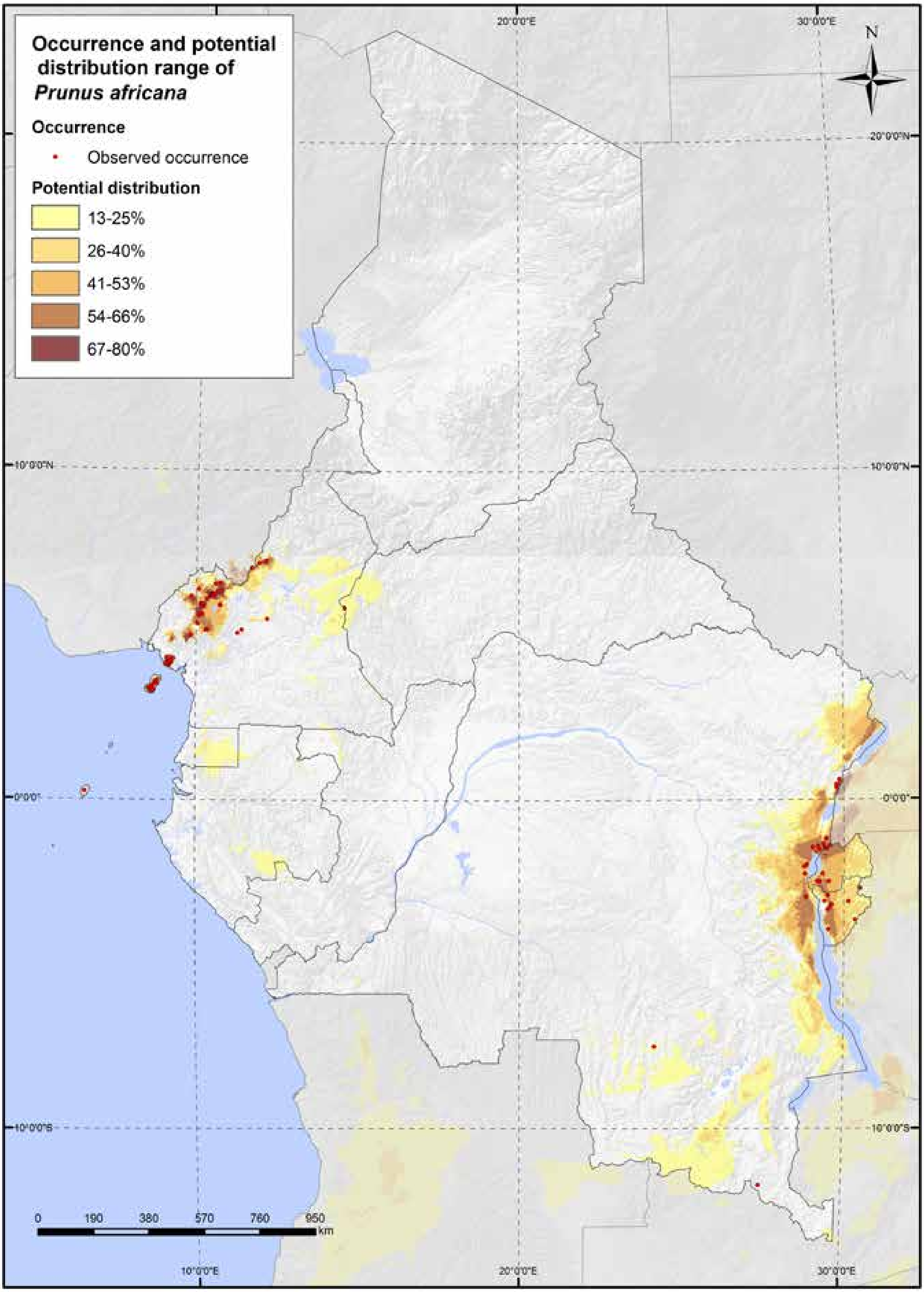


Data sources:
Soil erosion risk: Waterworld version 2 (2014) Model results from the Waterworld system (non commercial-use). http://www.policysupport.org/waterworld
Generated from WaterWorld scenario simulation based on complete removal of forest where Modis/Landsat forest exists and leaving soil bare after.
Watersheds: Lehner, B., Verdin, K., Jarvis, A. (2006): HydroSHEDS Technical Documentation. World Wildlife Fund US, Washington, DC. Available at http://hydrosheds.cr.usgs.gov.

Map projection: Lambert Azimuthal Equal Area Projection, latitude of origin 5 and central meridian 19
Map prepared by UNEP-WCMC.

Top: Prunus africana in flower (CC BY-NC 2.0) Scamperdale https://flic.kr/p/8xkXXJ
Bottom: Gully caused by erosion, Bas-Congo, DRC. © Blaise Bodin

Map 6. Occurrence and modeled potential distribution of *Prunus africana* (a tree of great importance for NTFPs) in COMIFAC countries. The potential distribution is presented here as the likelihood of *P. africana* occurring at a particular site, modelled on the basis of climatic/environmental parameters.



Source:Vinceti, B. et al., 2013. Conservation priorities for Prunus africana defined with the aid of spatial analysis of genetic data and climatic variables. G. G. Vendramin, ed. PloS one, 8(3), p.e59987. Available at: http://dx.plos.org/10.1371/journal.pone.0059987 [Accessed March 25, 2014].

Map projection: Lambert Azimuthal Equal Area, latitude of origin 5 and central meridian19. Map prepared by UNEP-WCMC, Cambridge.

2.3 Spatial analysis to support the planning of forest policies for climate and biodiversity objectives

More complex evaluations can be carried out by superimposing a number of different layers of spatial information, with a view to support the joint planning of REDD+ and Aichi Targets implementation. For example, superimposing indicators of the potential contribution of an area to climate change (high-carbon density from biomass, high deforestation pressure) and a series of indicators of the potential of the region for the conservation of biodiversity and its sustainable use (high species richness, particularly rare or threatened ecosystems, role in the provision of ecosystem services) may help to reveal areas where there may be multiple benefits from reducing deforestation

Information on biomass carbon and species richness can be combined in order to illustrate how the combination of multiple variables may be relevant to planning REDD+ actions in a way that supports the Aichi Targets and the Cancún safeguards. This enables general conclusions to be drawn on the potential for synergies between REDD+ initiatives and Aichi Targets at the regional level.

Forest elephant © Uryadnikov Sergey (licence Shutterstock)

Map 7 provides a regional scale overview of the different contexts that can exist for the implementation of REDD+ actions, including in relation to their potential impacts on biodiversity. Areas with high biomass carbon stock and potential species richness (**in dark red**), if they are demonstrated to be subject to future pressures, present opportunities for a reduction of emissions linked to deforestation and degradation, which can lead to benefits for conservation. These benefits would be over and above those that would result from a reduction of these pressures in areas of high-carbon but low biodiversity (**in pink**). Certain low-carbon and low biodiversity areas (**in beige**), offer few opportunities, a priori, for the reduction of emissions linked to deforestation. However, they could be identified as suitable, after a more detailed assessment including checking the local importance of the biodiversity present, for actions that aim to increase carbon stocks such as afforestation or restoration. Low-carbon areas that have high biodiversity (**in green**) could likewise be the object of such initiatives, although with risks to conservation of local species if they involve converting natural non-forest ecosystems by, for example, planting fast-growing exotic species.

This regional scale analysis supports an understanding of the range of contexts for REDD+ present across the region. However, more detailed and local analyses (including of a range of environmental variables, the socio-economic context and local policies), are needed for deciding upon the most relevant REDD+ initiatives within a location. The four illustrations presented in Map 8, allow for a discussion in more detail of the types of REDD+ actions that could be relevant in relation to forest cover, the presence of human pressures indicated by roads and urban centres, or the presence of land designation (protected areas, forest concessions).

These examples highlight the importance of local context and obtaining sufficiently detailed data for decision making on appropriate REDD+ actions at the local scale. As fine scale information can be difficult to gather and analyyse across the entirety of the Congo Basin region. The large scale combination and analysis of spatial data enables the prioritisation of more detailed spatial analysis in some areas, as presented on the examples of Map 8 (see also box opposite).

Pirogue on the Congo River at dusk © Blaise Bodin

EXAMPLE 1: MOUNT CAMEROON REGION

Features highlighted by the spatial analysis

- High carbon density
- Rapid degradation of the natural forest cover, replaced by agricultural plantations
- Pressures of agricultural exploitations around Mount Cameroon National Park

Potential REDD+ actions and synergies with the Aichi Biodiversity Targets: *Important benefits for the conservation of threatened species could result from REDD+ actions for the conservation of remaining forest fragments in this area, potentially by strengthening the network of protected area and enhancing its connectivity through the establishment of wildlife corridors.*

EXAMPLE 2: TRI-NATIONAL SANGHA

Features highlighted by the spatial analysis

- Extremely high forest cover and biomass carbon
- Relatively little deforestation, probably because of important efforts made for the conservation of this area
- High species richness but few threatened species due to the relative remoteness of this area and the reinforced protection

Potential REDD+ actions and synergies with the Aichi Biodiversity Targets: *Unless there is an increase of pressure for land-use change in this area (as showed by modelling, in a scenario with new pressures arising such as mines), there are limited possibilities for the implementation of REDD+ actions (other than the continuation of conservation efforts), due to low pressures and already high carbon stocks.*

EXAMPLE 3: 'POOL MALEBO' REGION

Features highlighted by the spatial analysis

- Fuelwood supply basin for capital cities of Brazzaville and Kinshasa
- High pressures on ecosystems in an area already widely degraded with low species richness

Potential REDD+ actions and synergies with the Aichi Biodiversity Targets: *Area suitable for reforestation actions, especially in areas identified locally as being degraded, potentially with fast-growing species which can be used for sustainable exploitation of firewood (while protecting any remaining forest fragments)*

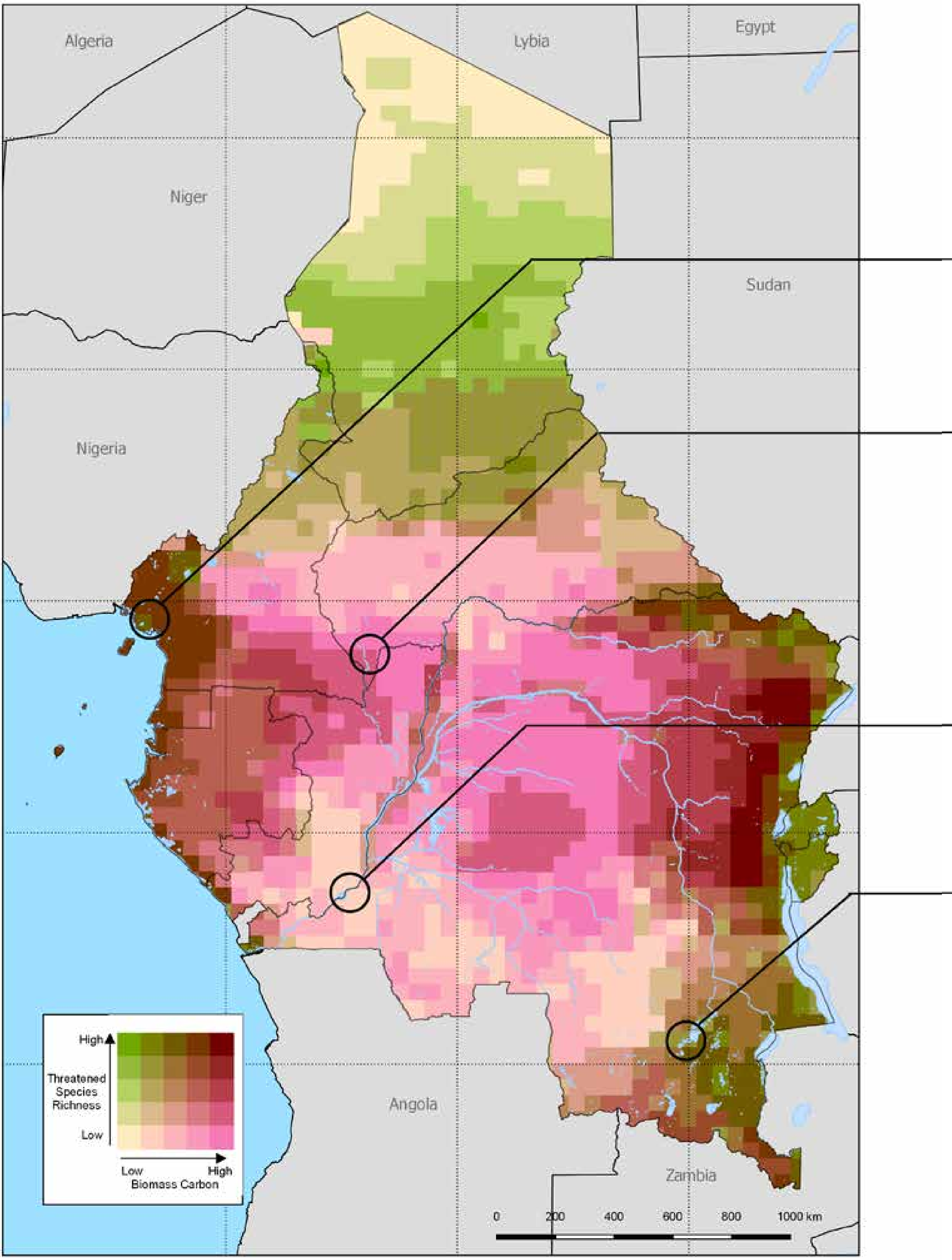
EXAMPLE 4: MIOMBO FORESTS OF KATANGA

Features highlighted by the spatial analysis

- Forest-savannah mosaic with a relatively low carbon density compared to dense moist forests
- High species richness, highly threatened
- High deforestation rate, possibly because of fires

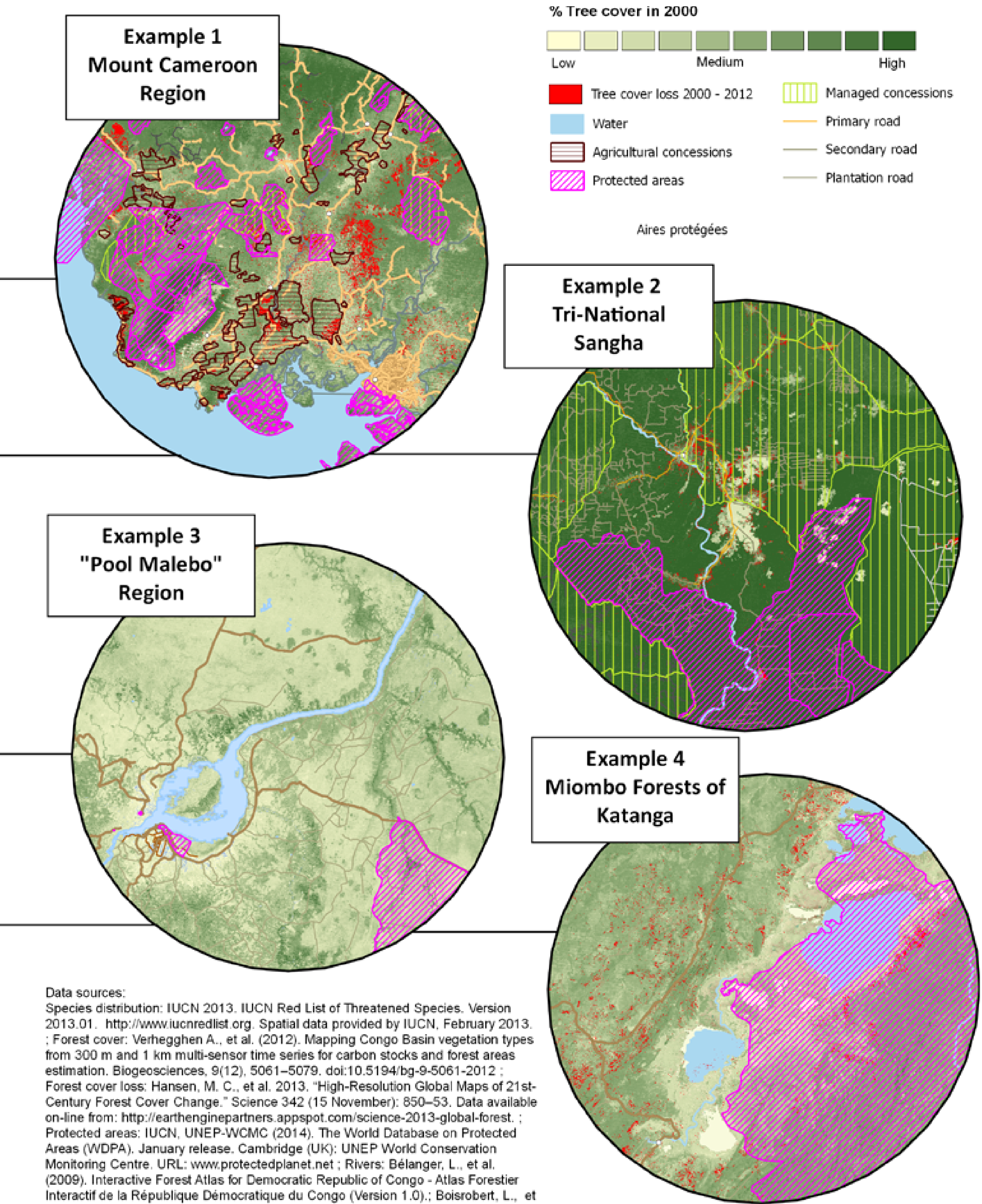
Potential REDD+ actions and synergies with the Aichi Biodiversity Targets: *The potential shift of land-use pressures on Miombo open forests, due to REDD+ priority implementation in areas with the highest carbon density, could have an impact on the conservation of open forests and natural savannahs. Actions to reduce fires of human origin could help conserving these open forests.*

Map 7. Forest biomass carbon and potential species richness (threatened species)



Map projection: Lambert Azimuthal Equal Area Projection, latitude of origin 5 and central meridian 19
Map prepared by UNEP-WCMC.

Map 8. Examples of spatial data for more detailed REDD +planning



Data sources:
Species distribution: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.01. http://www.iucnredlist.org. Spatial data provided by IUCN, February 2013. ; Forest cover: Verhegghen A., et al. (2012). Mapping Congo Basin vegetation types from 300 m and 1 km multi-sensor time series for carbon stocks and forest areas estimation. Biogeosciences, 9(12), 5061–5079. doi:10.5194/bg-9-5061-2012 ; Forest cover loss: Hansen, M. C., et al. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." Science 342 (15 November): 850–53. Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest. ; Protected areas: IUCN, UNEP-WCMC (2014). The World Database on Protected Areas (WDPA). January release. Cambridge (UK): UNEP World Conservation Monitoring Centre. URL: www.protectedplanet.net ; Rivers: Bélanger, L., et al. (2009). Interactive Forest Atlas for Democratic Republic of Congo - Atlas Forestier Interactif de la République Démocratique du Congo (Version 1.0).; Boisrobert, L., et al. Interactive Forest Atlas for Central African Republic - Atlas Forestier Interactif de la République Centrafricaine (Version 1.0). ; Mertens, B., et al. Interactive Forest Atlas for Gabon - Atlas Forestier Interactif du Gabon (Version pilote). ; Mertens, B., et al. Interactive Forest Atlas of Cameroon - Atlas Forestier Interactif du Cameroun (Version 3.0). ; Tessa, B., et al. Interactive Forest Atlas of Congo - Atlas Forestier Interactif du Congo (Version 3.0).; Tessa, B., et al. Interactive Forest Atlas of Equatorial Guinea - Atlas Forestal Interactivo de la Republica de Guinea Ecuatorial (Version 1.0).

Species distribution: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.01. http://www.iucnredlist.org. Spatial data provided by IUCN, February 2013.; Couvert forestier : Verhegghen A., et al. (2012). Mapping Congo Basin vegetation types from 300 m and 1 km multi-sensor time series for carbon stocks and forest areas estimation. Biogeosciences, 9(12), 5061–5079. doi:10.5194/bg-9-5061-2012.

Tailoring the analysis to specific REDD+ actions can also increase the relevance of the analysis. The term “REDD+ action” is here understood as any type of policy and its implementation which contributes to the reduction of deforestation and forest degradation, or to enhancing forest carbon stocks, thus reducing emissions from forests as measured at the national or jurisdictional level. In a number of countries, “pilot” REDD+ projects are already being implemented, including by private actors. Although these projects could eventually become integrated in the national efforts to reduce emissions in the forest sector, they are not directly considered in this report.

Due to the multiplicity and the complexity of the drivers of deforestation and degradation in the Congo Basin, a wide range of actions can be needed within national REDD+ strategies and to ensure a sustainable reduction of emissions in the forest sector. However a review the REDD+ preparation plans of the COMIFAC countries sheds light on some common elements. In the majority of COMIFAC countries, forests are under State ownership and are generally organized in administrative categories for production, sustainable use and conservation. The complete zoning of national forest cover, of a permanent forest domain and its allocation in production forests, protected areas or other designations is an overarching action that can be undertaken to enable the planning of more specific actions to contribute to a net emission reduction from forests.

Another action that can be found in many of the R-PP of the COMIFAC countries is agricultural intensification. Agricultural intensification can support higher yield per unit area than can be achieved in low-intensity systems of shifting cultivation. It could therefore contribute to reducing land use conversion pressure by enabling agricultural demand to be met within a smaller area of land. A decrease in the conversion of natural ecosystems, including forests, would contribute to the objectives of REDD+ and CBD. However, agricultural intensification on its own is unlikely to cause such a decrease. Increased yields, alongside the development of transport infrastructure, can increase the profitability of agriculture and so lead to an increase in natural areas converted (agricultural “rebound” effect) (Megevand 2013). The effectiveness of agricultural intensification policies in reducing deforestation and degradation thus depends on their integration into the overall planning of the national territory and associated enforcement measures in order to mitigate this rebound effect. The ways in which intensification is implemented also matter. Industrialization of agriculture can have collateral negative impacts on climate and biodiversity. Ecological forms of intensification such as integrated ecosystem management, agro-forestry or “Climate Smart” agriculture are less likely to have such effects and can support the integrated planning of the territory. Due to data limitations, spatial analysis for REDD+ actions in the agricultural sector could not be produced for this report. The modelling results of the REDD-PAC project should however provide useful information in this regard.

The analysis presented in the following sections does focuses on a limited set of actions to illustrate how spatial analysis can be useful to draw links with the Aichi Targets. The following sections present different spatial analyses that serve to draw general conclusions applicable at sub-regional level for three major types of REDD+ initiatives that are particularly relevant to the sub-region:

- Actions for the conservation of forests based on extending or enhancing the efficiency of the network of protected areas (Section 3);
- Actions for the sustainable management of production forests (Section 4)
- Actions for reforestation and forest restoration (Section 5).

For each of the REDD+ actions presented, the potential for synergies with Aichi Targets will be explained. Possible links with the implementation of the COMIFAC Convergence Plan are highlighted at the beginning of each section, to illustrate how regional policies could help achieve REDD+ and Aichi Targets.

Likouala River, DRC © Terah U. DeJong

3. REDD+ actions for forest conservation

Aichi Targets discussed:

Target 5 - Decrease the loss of natural habitats

Target 11 – Expand the protected area coverage

Target 12 – Prevent species extinction

Relevant elements of the Convergence Plan :
Strategic Focus 1 – Conservation and optimisation of natural resources; Operational objective 3.1.1 - Strengthen the network of national and transboundary protected areas; Operational objective 3.1.2 - Ensure ecological biodiversity monitoring within and outside protected areas

One possibility for the implementation of REDD+ is to reduce deforestation and forest degradation through the conservation of existing forests, by maintaining, and potentially expanding, an effective network of protected areas. This type of REDD+ action can support Aichi Target 11 on the establishment of a networks of protected areas that are representative and effective. This criterion of resprentativity can be met if attention is given to the balance in the proportion of the ecosystems covered by the protected areas network (Section 3.1). REDD+ actions for the conservation of forests also contribute to Aichi Target 5 on reducing the loss of natural habitats, especially if they focus on the conservation of natural forests (Section 3.2).

3.1 Contribution of REDD+ to a network of effective and representative protected areas

Protected areas can contribute to a reduction in emissions from deforestation and forest degradation in two main ways: through the expansion of protected areas networks to include the conservation of new forest areas, and by enhancing the effectiveness of existing protected areas.

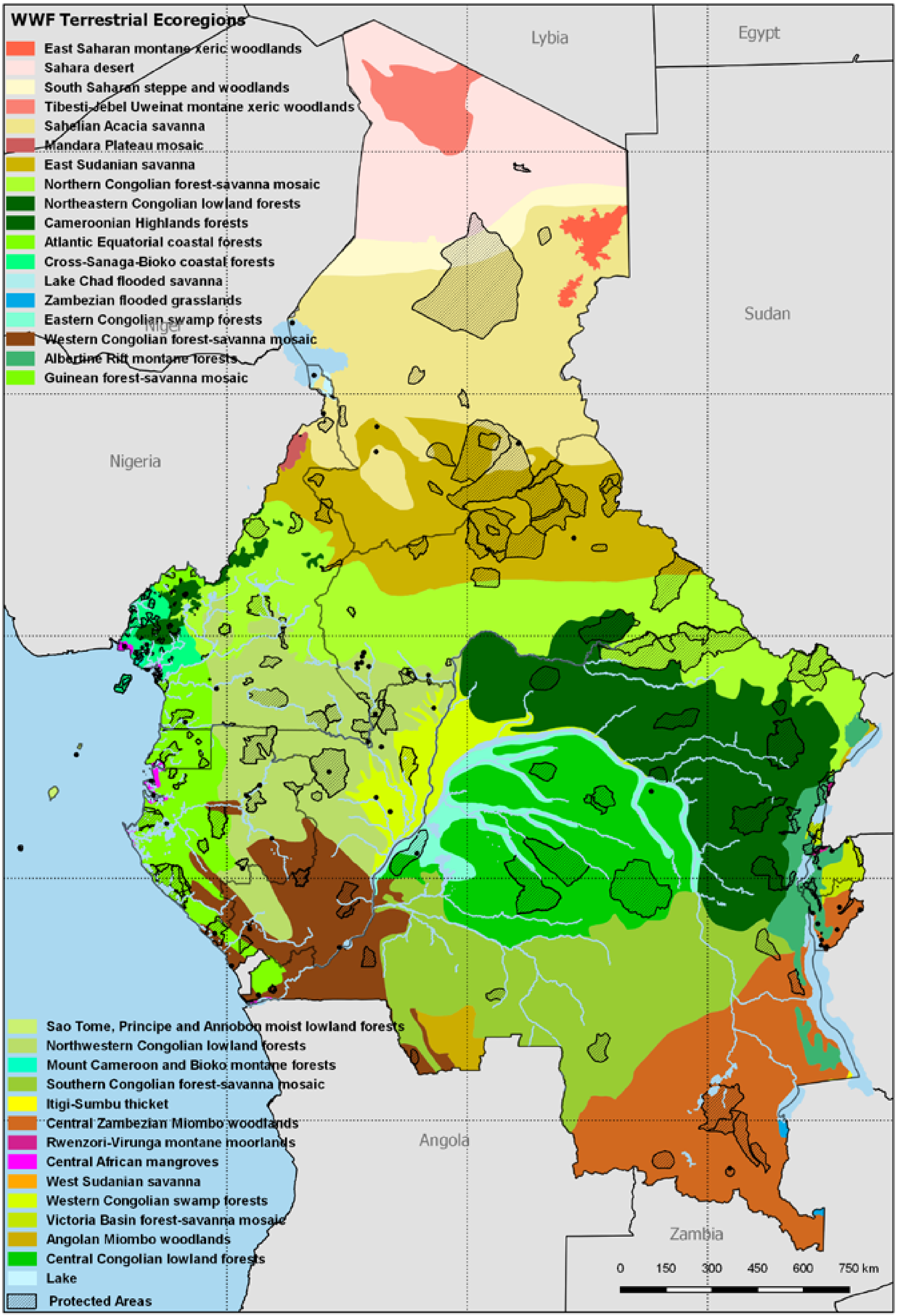
National forest zoning and planning processes generally contribute to the implementation of REDD+ as "enabling actions" that clarify the distribution of different land uses. These processes could also contribute to REDD+ through the zoning of new areas of forest for conservation and new protected areas. In these areas, activities responsible for deforestation and degradation would be excluded, or made more sustainable, depending of the exact status of the protected area thus created. In some countries such actions may, however, require a prior assessment of the exact location and legal status of the existing network, as is the case in the DRC under the PARAP project[4].

Institutions are already in place to conduct this kind of assessment at the sub-regional level, such as the Protected Area Network in Central Africa (RAPAC). This federative network is intended as a platform for harmonization, coordination, exchange and support between the actors involved in the management of protected areas and optimised use of natural resources. It is mandated by COMIFAC for the implementation of Axis 4 of the Convergence Plan on the conservation and enhancement of biodiversity. When this report was written, spatial data on protected areas at the subregional level was not yetavailable from RAPAC· The data used instead is from the World Database on Protected Areas. This database collects data submitted by governmental agencies responsible for protected areas. The information it contains is sometimes incomplete and might not reflect the current status of the network of protected areas.

According to this data, the proportion of land area under protected status in COMIFAC countries is around 11% at present (Table 2). This type of action could help to achieve Aichi Target 11, which calls for the designation under conservation status of "at least 17% of the land area by 2020". Aichi Target 11 however, also calls for those networks of protected areas to be "ecologically representative". An analysis of the distribution of protected areas across the ecoregions of the Congo Basin areas reveals that protection is not evenly distributed (Map 9). Among the thirty-two ecoregions within COMIFAC countries, only eight of them are protected to 17% or more, five are between 10 and 17%, nine between 1 and 10%, and ten less than 1% (Figure 1). This type of assessment is particularly relevant because of the potential risk that the implementation of REDD+ through the expansion of protected areas could create an imbalance in favor of protection of ecosystems with higher carbon densities. This imbalance could lead to a displacement of pressures from these carbon-rich ecosystems, such as humid dense forests, towards lower carbon and less protected ecosystems, such as woodlands and savannas.

[4] For more information: http://www.wwfcongobasin.org/where_we_work/democratic_republic_of_congo/protected_area_programme_in_the_drc/

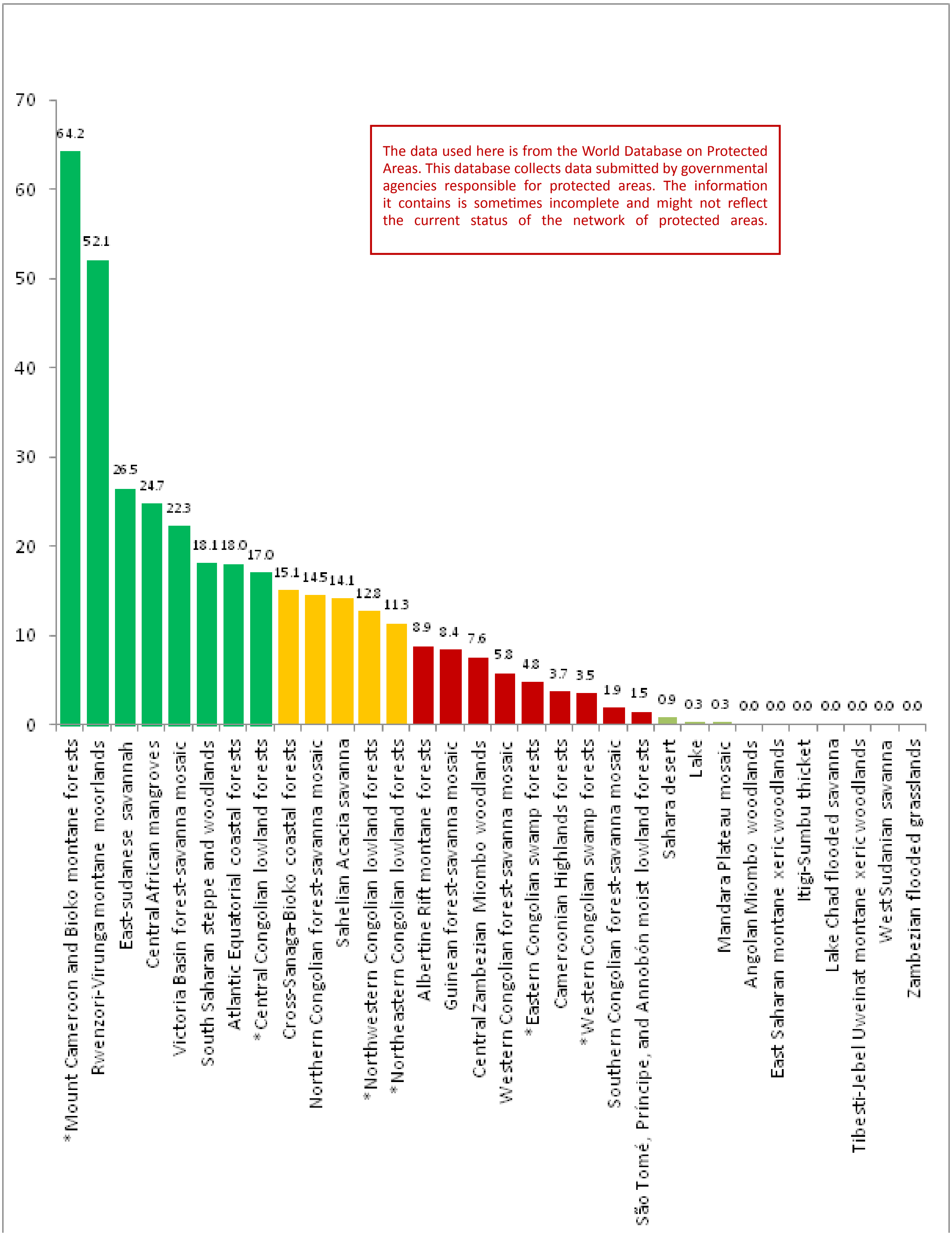
Map 9. Coverage of the eco-regions in the Congo Basin by the sub-regional network of protected areas



Data source: Olson, D. M., et al. 2001. Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11):933-938.

Map projection: Lambert Azimuthal Equal Area Projection, latitude of origin 5 and central meridian 19
Map prepared by UNEP-WCMC.

Figure 1. Proportion covered by the network of protected areas for each ecoregion



Coverage of each biome by Protected Areas in % of total area in the region

*Biomes endemic to the region are preceded by a **

Top: Collecting firewood, Democratic Republic of Congo (CC BY-NC) ND 2.0) Ollivier Girard / CIFOR https://flic.kr/p/dkEEuh
Bottom: Islands on the «Pool Malebo» ©Blaise Bodin

Another opportunity for REDD+ action through the conservation of forest resides in the fact that many protected areas in the sub-region are currently not completely effective due to a lack of resources. This lack of effectiveness is illustrated by the current loss of forest cover within protected areas in the region (Table 2) and the recent deforestation visible in some of them (Maps 10 and 11). This effectiveness could be improved through better management and supported by increased availability of resources to the agencies responsible for those protected areas, helping to achieve Aichi Target 11, which calls for "protected areas effectively and equitably managed". In light of the high incidence of poverty in the rural populations that may be partly responsible for the degradation of the forest in these areas, respecting this Ultimately however, it also depends on the provision of alternative livelihoods for those populations who.

These types of actions could result in a reduction of deforestation compared to a baseline scenario where the current levels of effectiveness would be maintained. Such examples exist in other areas - actions for monitoring and implementation of existing legislation were an important part of the success of countries such as Brazil in attracting international funding to reduce emissions from the forest sector (Nepstad *et al.* 2014; Soares-Filho *et al.* 2014). REDD+ actions to improve the effectiveness of protected areas would be particularly relevant in the light of the substantial proportion of biomass carbon they contain (Table 2).

3.2 REDD+ actions for the conservation of natural habitats, including forests

Reducing deforestation and degradation presents obvious synergies with **Aichi Target 5**, which aims to reduce the rate of loss of all natural habitats, including forests. So that REDD+ can contribute to this goal, it is important to identify and preserve the forests that are closest to a "natural" state. Identifying and protecting these areas of natural forest can also help the implementation of Cancun safeguard (e), which provides that "[REDD+] actions are consistent with the conservation of natural forests and biological diversity, ensuring that [REDD+] actions are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests [...]". The UNFCCC does not specify the definition of a natural forest, but leaves countries to do so in their national context.

At the sub-regional level, the distribution of "Intact Forest Landscapes"[5] ('IFLs') can be used as an indicator of the presence of relatively undisturbed natural forests on continuous surfaces conducive to the maintenance of ecological processes. IFLs are also likely to contain old growth forests, which accumulate large amounts of carbon, of which could be released into the atmosphere if they were to become degraded (Luyssaert *et al.* 2008).

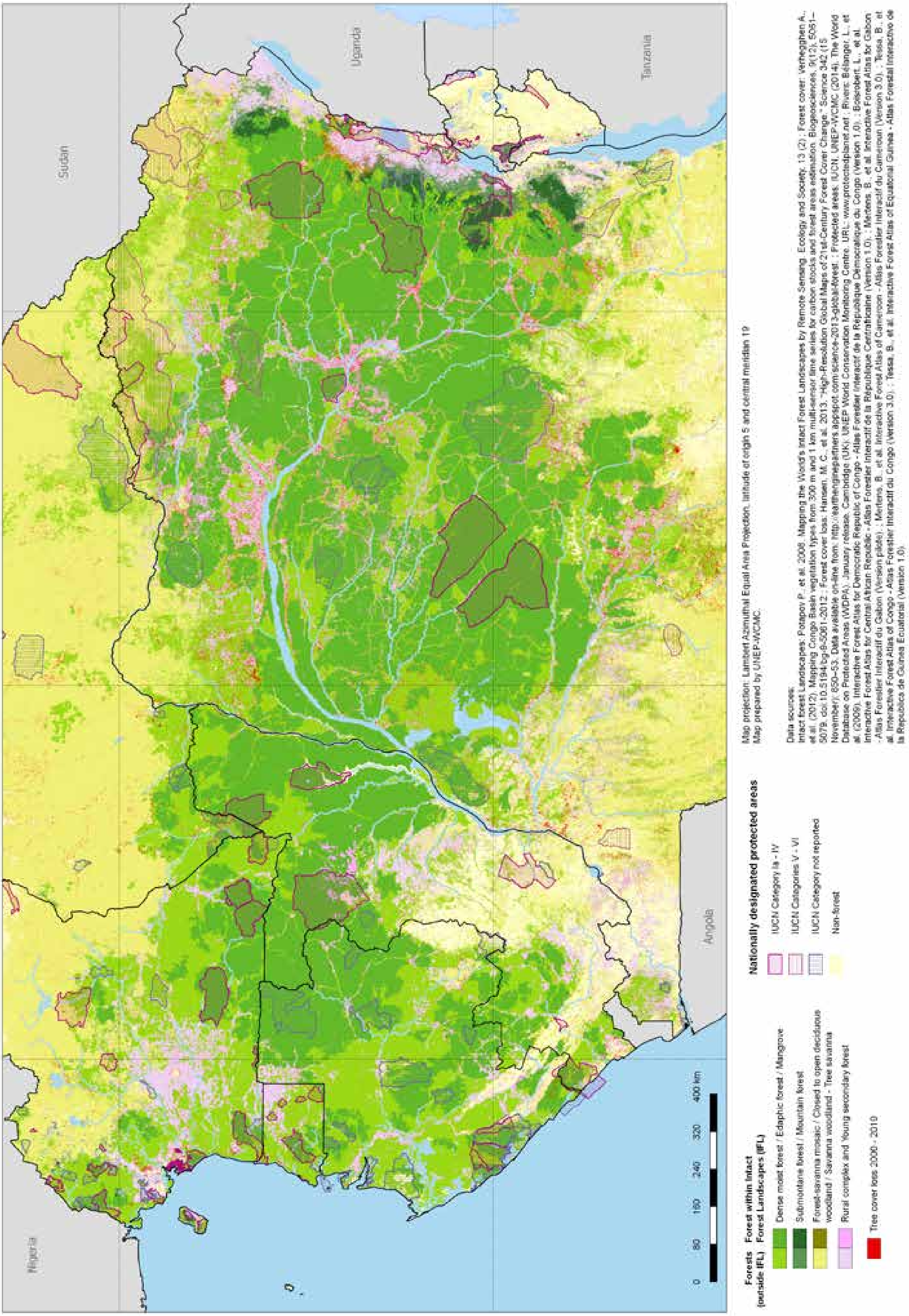
[5] Intact Forests Landscapes (IFLs) are defined as "an unbroken expanse of natural ecosystems within the zone of current forest extent, showing no signs of significant human activity, and large enough that all native biodiversity, including viable populations of wide-ranging species, could be maintained". Information on the methodology to identify IFLs can be found in Potapov *et al.* (2008).

Table 2 - Carbon and deforestation in protected areas

Carbon and deforestation in protected areas designated at the national level.[i]	Proportion of territory covered by the network of protected areas (%)	Proportion of biomass carbon in protected areas (%)	Total area of protected areas (km²)	Gross deforested area in protected areas between 2000-2012 (km²)
Dem. Rep. of Congo	10.1	11.8	235 796	2 230
Chad	11.6	20.0	147 111	215
Centr. African Rep.	17.4	16.9	107 893	302
Cameroon	9.4	12.0	43 645	133
Gabon	15.0	13.5	39 606	134
Rep. of Congo	9.4	11.8	32 213	96
Equatorial Guinea	19.2	17.1	5 183	36
Rwanda	9.8	17.8	2 469	18
Burundi	3.6	7.8	977	5
TOTAL COMIFAC	11.5	12.6	614 894	3 170

[i] These figures were calculated on the basis of data from the World Database on Protected Areas (www.protectedplanet.org).Thes figures are imperfect and an analysis at the national level would ideally be based on the most recent data available from the relevant governmental agencies.

Map 11 - Recent deforestation in Intact Forest Landscapes and protected areas



This claim is supported by the analysis of data on biomass carbon which show an average carbon density of 202 TCar/km^2 in the IFLs, a high value compared to the overall variation in the region presented on Map 1.

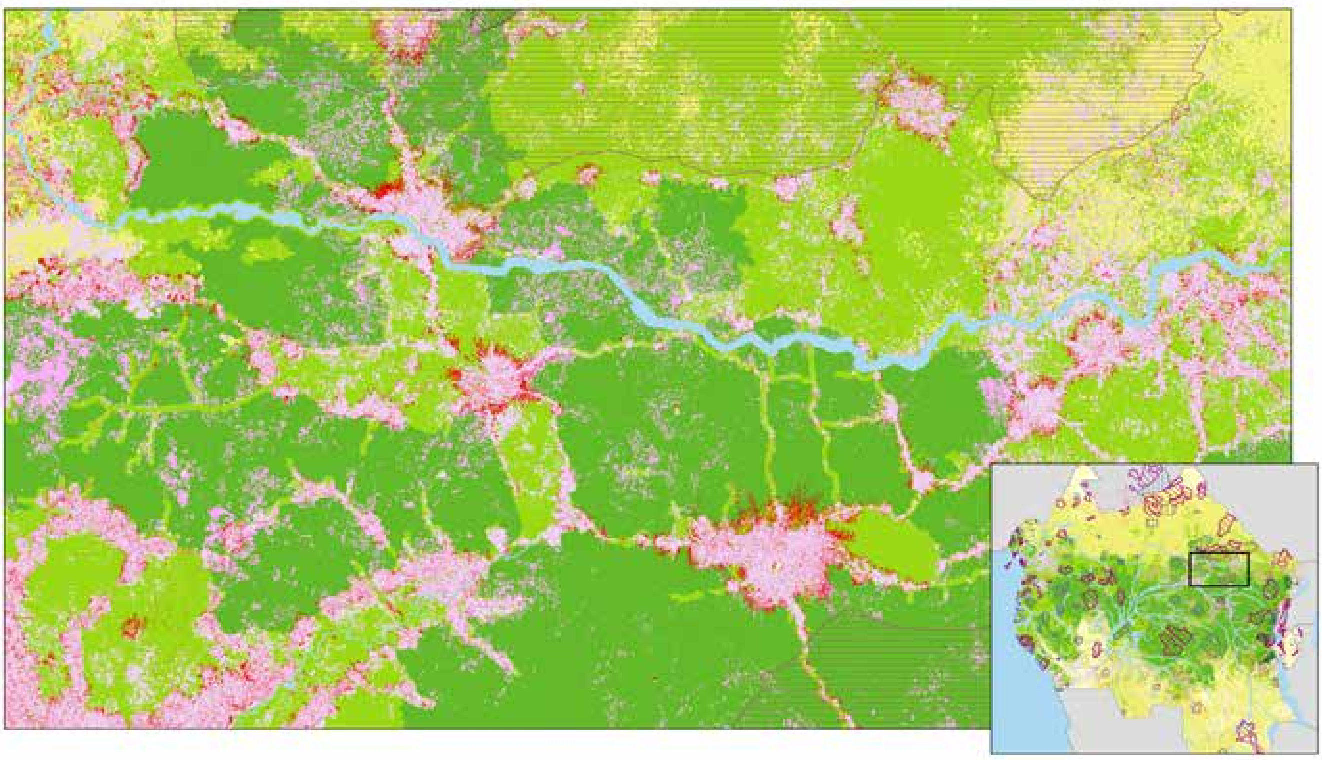
The consideration of IFLs in the planning of REDD+ actions for forest conservation would also contribute the goal of limiting fragmentation of natural habitats under Aichi Target 5. Map 10 illustrates how the progression of deforestation, which transforms the dense forests into a "rural complex"[6], leads gradually to the fragmentation of these large forest areas. Over the past 10 years, the Congo Basin has recorded a loss of 5.2 million hectares of IFLs, partly due to fragmentation causing areas to become too small to meet the IFL criteria (Thies *et al.* 2011). This lost area is not directly comparable with gross forest cover loss in the same period: the loss of a relatively small area of forest can be enough to fragment a landscape and result in the disqualification of a much larger area of IFL.

The maintenance of large contiguous forest areas is also particularly important for the conservation of large mammals. The survival of these species, including great apes and elephants, is a stated objective at the national level in many countries in the sub-region, but also at the regional level through the Convergence Plan and other international commitments such the Kinshasa Declaration on Great Apes Conservation.

The conservation of large mammals also contributes to the resilience of forests and their carbon stocks due to their role in seed dispersal (Abernethy *et al.* 2013). Actions for the conservation of natural forest (implemented to reduce carbon emissions from deforestation and degradation) can benefit forest-dwelling species by reducing the loss and disturbance of their habitat. However, there remains a risk of transfer of land conversion pressures from high-carbon to low-carbon ecosystems, with potential adverse effects on non-forest species (Miles & Kapos 2008; Miles & Dickson 2010). Conserving areas particularly dense in carbon and important for species conservation should therefore not detract from the need to maintain a balance between the different forests types represented in the sub-region. Map 11 shows the distribution of different forest types, here grouped into three broad categories: rainforest, dry/woodland and montane forest, in relation to the existing network of protected areas and recent deforestation.

6 Defined as an area where canopy cover is between 10-30%and the proportion of land used for agriculture is higher than 50% (Mayaux *et al.* 2013).

Map 10 - Recent deforestation in Intact Forest Landscapes and protected areas. This close up shows the progression of deforestation, which transforms the dense forests into a "rural complex". See Map 11 for source information.



4. REDD+ actions for the sustainable management of forests

Aichi Targets discussedd:

Target 7 - Sustainable management of areas under agriculture, aquaculture and forestry

Target 12 - Prevent species extinction

Relevant elements of the Convergence Plan:

Strategic focus 2 – Sustainable management and optimisation of forest resources; Strategic objective 2.1 - Ensure preservation of forest ecosystems, in a consultative process of land-use planning; Operational objective 2.1.1 - Enhance qualitative and quantitative knowledge on forest and fauna resources; Operational objective 2.1.2 - Arrange planning of forest ecosystems; Operational objective 2.1.3 - Strengthen the planning of forest areas and secure them for the long-term

REDD+ actions for the sustainable management of production forests can help reduce emissions in these areas. Different types of sustainable management can be introduced through regulation of industrial logging activities, and enforcement can be made more effective by monitoring and enhanced control or through economic incentives. Such actions may also contribute to Aichi Target 7, which calls for the sustainable management of areas for forestry. Forest concessions for the production of timber, being particularly widespread in the region and representing a significant proportion of the total forest cover, could represent an important tool for achieving REDD+ and Aichi target objectives. Spatial analysis can help establish priorities in the implementation of these actions, for example through the identification of concessions of particular interest for the conservation of threatened species (in relation with Aichi Target 12).

The addition of "sustainable management of forest carbon stocks" among the activities covered by the "+" of REDD+ was in response to a specific demand of the COMIFAC countries during negotiations within the UNFCCC (Kasulu *et al.* 2008). This request reflected the concern of countries in the Congo Basin that the substantial forest areas under concession, distributed mainly among six countries - Cameroon, Republic of Congo, DRC, Gabon, Central African Republic and Equatorial Guinea - should not be excluded from the funding mechanism. For some of them, such as Gabon or the Republic of Congo, forests under concession represent a large proportion of the national forest cover (29 and 46% respectively) and forest carbon reserves (see Table 3 for the detail by country), making them a necessarily central component in the development of their national REDD+ strategies.

Sustainable management of forest is here understood as a change in the management of forest concessions caused by a change in national policies and regulations that apply to these activities. This change could contribute to the national results in terms of reducing emissions in the forest sector that may be remunerated under REDD+.

Principles of sustainable management for production forests are already provided by national policies and regulations of most countries in the sub-region. However, these regulations are enforced to varying degrees. In 2010, only 90 of the 293 concessions in the region had a management plan approved, 95 were in the process of developing one and only 95 were certified (Nasi *et al.*, 2010). Statistics calculated on the basis of the most recent data are presented in Table 3, and Maps 12 and 13 also display concessions based on their status and the presence of a management plan. The presence of a management plan does not ensure its effective application. This means that the degradation levels may be higher in practice than those that would result from effective implementation of the applicable national regulation. In response to these enforcement challenges, the strengthening of national capacities for implementation, monitoring and control of these regulations, and incentivising

Savanna landscape in La Lopé National Park , Gabon. © Blaise Bodin

their application through economic or tax benefits are two possible REDD+ actions for the sustainable management forest in concessions.

In addition, the introduction of new operating standards of reduced impact logging to national regulations could also be considered a REDD+ action if it is proven to bring a further reduction in the emissions resulting from forest exploitation (Poulsen *et al.* 2009). Another possibility is for national policies to build on existing forest certification schemes from private sources. Such systems, notably Forest Stewardship Council (FSC) certification, are already applied in some of the concessions in the sub-region, including Cameroon, Gabon and Republic of Congo (see Table 3 for statistics on certification and Maps 12 and 13 for the distribution of certified concessions in those countries). Those schemes could be extended to all production forests, through regulation and control or economic incentives. Certification systems have the advantage that they are not just about carbon but entail a wider management of social and environmental impacts, including on biodiversity.

The implementation of the REDD+ actions for sustainable management of forests under concession could contribute to meeting **Aichi Target 7**, which calls for sustainable management of areas under agriculture, aquaculture and forestry by 2020. Concessions, when sustainably managed, can indeed represent areas conducive to the maintenance of important forest biological diversity (Clark *et al.* 2009; Nasi *et al.* 2010.). In order to also limit indirect impacts on wildlife, management plansshould also include mitigation measures against indirect effects on wildlife associated with the consumption of bush meat by employees of the concession (Vliet *et al.*, 2010). Some forest concessions also overlap with the range of endangered species. The improved management of these forests may therefore also contribute to **Aichi Target 12** on avoiding extinction of known threatened species by improving or maintaining their habitat.

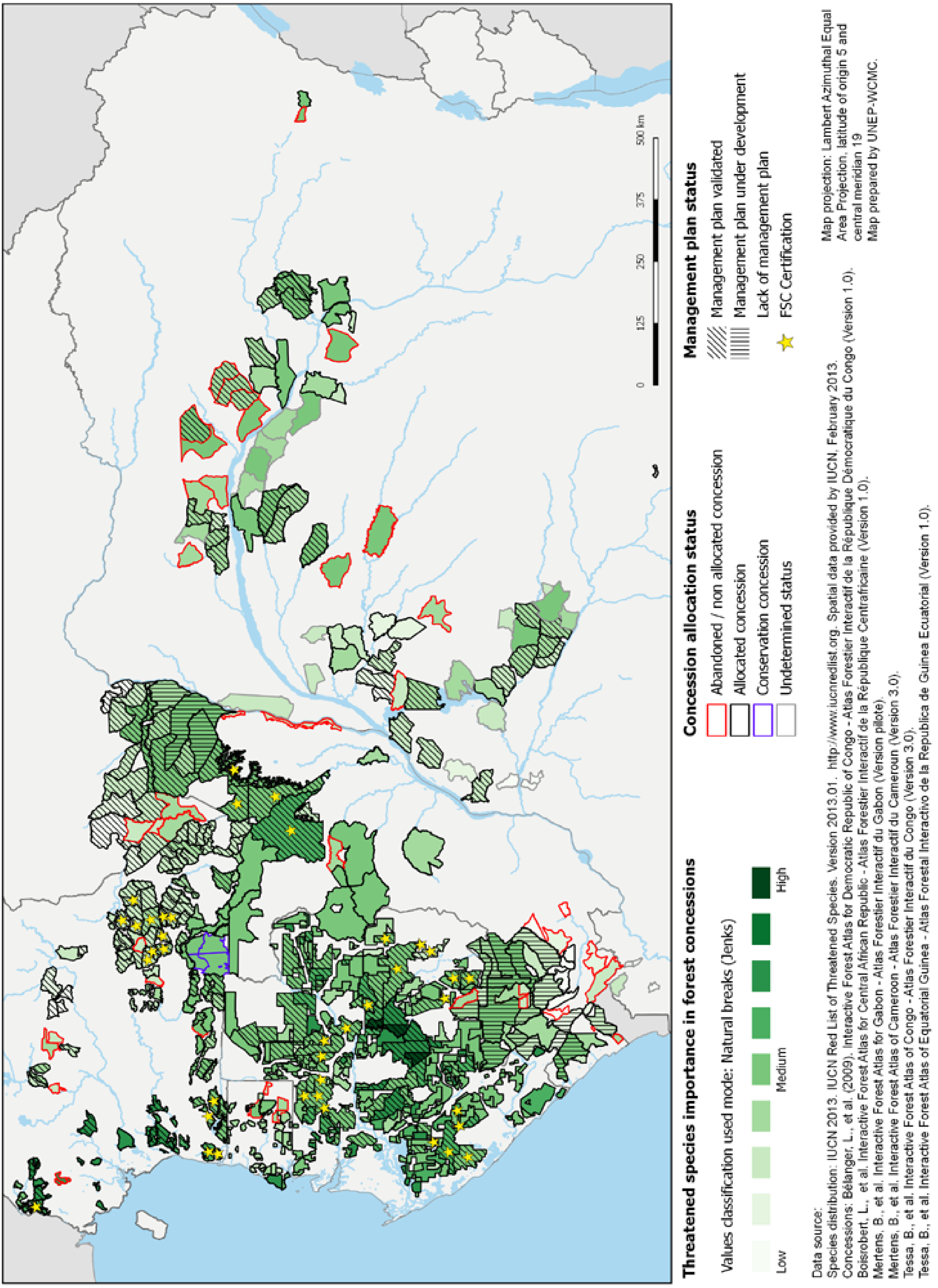
FSC certified timber ready to be shipped down the river, Pokolo, Congo (CC BY-NC) ND 2.0, CIB 027 Flickr

Maps 12 and 13 present a preliminary analysis of the relative importance of forest concessions for endangered species. This analysis highlights those concessions where the introduction of sustainable management could contribute most to the conservation of these species. The analysis is based on an importance index based on the number of potentially threatened species present in each concession and their degree of endemicity to these concessions (see Appendix I for detailed methodology). This type of analysis could help set priorities for the implementation of sustainable management policies in forest concessions at the sub-regional level (Map 12) or national level (Map 13). Priority would be given to those concessions where improvements offer the most synergies with the objectives of the CBD. Prioritization shown here is based on an index of importance for the survival of endangered species (in conjunction with the Aichi Target 12), but could be declined for other variables relevant to the implementation of other Aichi Targets, such as the presence of ecosystem services.

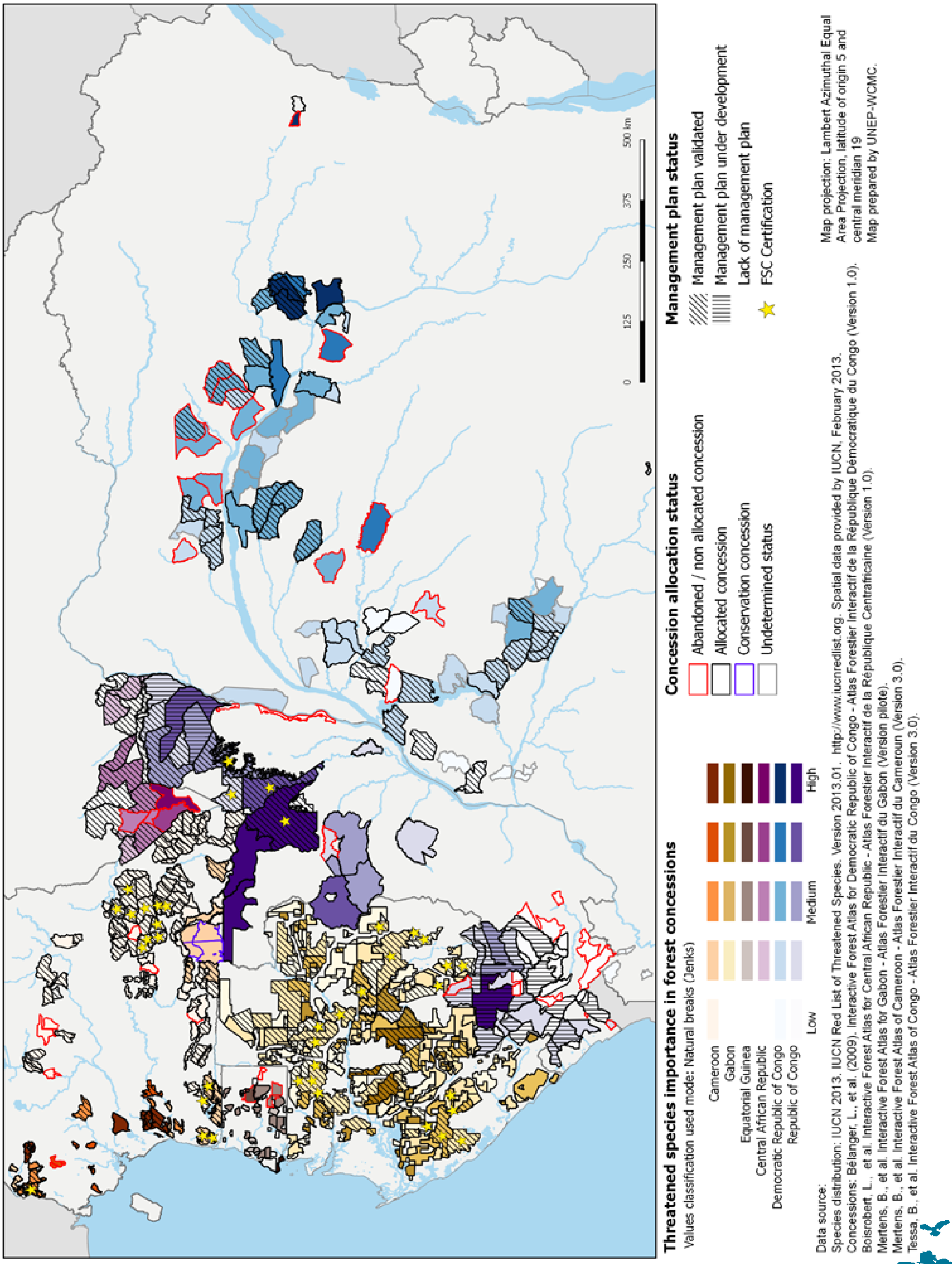
Table 3 - Carbon content and deforestation levels in forest concessions

Data sources: WRI Congo Basin Forest Atlases (http://www.wri.org/our-work/project/congo-basin-forest-atlases) Baccini 2012, Hansen 2013	Area under concession (with management plan, *under certification*) (in thousands Km²)	Forest cover under concession, in proportion of total forest cover (includes all forest types) (%)	Carbon content under concession, in proportion of total biomass carbon (%)	Average annual forest cover loss within concessions between 2000 and 2012, in Km²
Gabon	91 (38; *31*)	29.0	30.4	27.7
Cameroon	71 (58; *10*)	16.2	26.1	16.3
Republic of Congo	141 (86; *25*)	45.9	53.5	111.6
DRC	151	3.8	5.1	204.4
Equatorial Guinea	7.4	10.2	10.3	2.4
CAR	37	5.3	14.2	47.7
COMIFAC	498.4	10.6	15.9	68.4

Map 12. Relative importance of forest concessions for the conservation of threatened species at the sub-regional scale



Map 13. Relative importance of forest concessions for the conservation of threatened species at the national scale



5. REDD+ action for reforestation and forest restoration

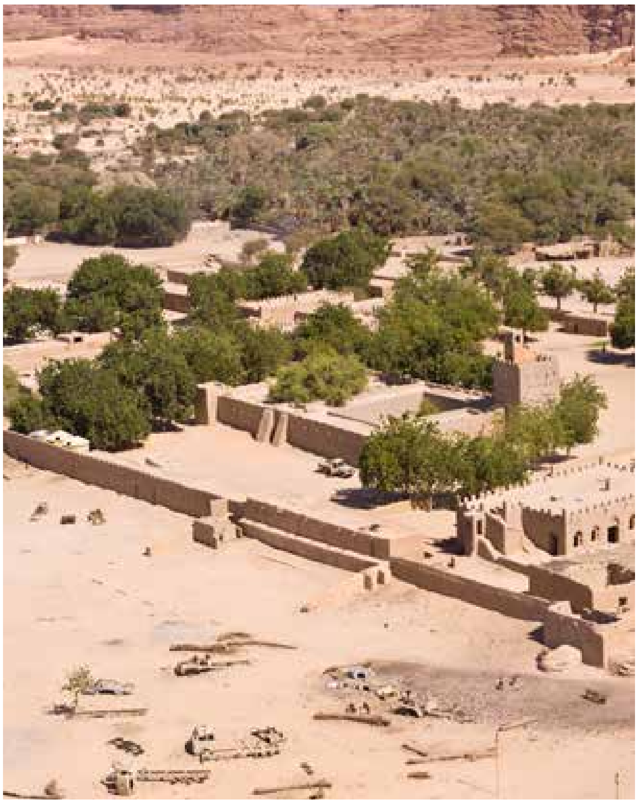
Aichi Targets discussed:

Target 14 – Ecosystems and essential services safeguarded

Target 15 – Ecosystems restored and resilience enhanced

Relevant elements of the Convergence Plan:

Strategic Focus 1 4 – Action to combat the effects of climate change and desertification; Operational objective 4.2 – Reverse forest and land degradation; Operational objective 4.2.2 -Develop and implement national programmes of reforestation and forest restoration



Aerial view of desert village, Tchad © Ecoimages (licence Shutterstock)

Reforestation and forest restoration have been included within REDD+ Readiness Preparation Proposals (R-PP) of COMIFAC countries as part of the REDD+ activity of enhancing forest carbon stocks. Such plans are very relevant for Aichi Target 15, that 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 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification. In addition, the establishment and sustainable management of forest plots for fuelwood collection is potentially important for sustainably managing the strong dependence of the populations of the Congo Basin on firewood for their energy needs (Mégevand, 2013). By providing alternative sources of fuelwood, these reforested areas could help reduce pressure from degradation on natural forests. In addition to providing essential ecosystem services (fuelwood), these reforested areas could also promote many other regulatory services, such as reducing soil erosion and degradation, pollination and regulation of local climate, in line with Aichi Target 14.

The need for these services is particularly urgent in severely degraded regions like the northern Sahel of Cameroon and Chad. There, restoring forests to enhance carbon stocks could be based on synergies with existing action plans to combat desertification (Great Green Wall or and the Sahel Initiative). Because of the lack of time and data, a spatial analysis of potential opportunities for forest restoration could not be carried out within the framework of this report. However, two examples of possible analyses that might support the spatial planning of REDD+ initiatives for reforestation are suggested below.

- An analysis of soil erosion and other indicators of land degradation, combined with information on population density, could indicate where the restoration of forest cover through planting of sustainable wooded plots might have the greatest potential benefits for local populations in terms of ecosystem services of water supply and regulation.

- An analysis of the spatial variation of the maximum potential of carbon sequestration through global models of biomass carbon (Caldararu *et al.* 2014), combined with information on fragmentation and wildlife corridors, could help to determine the high-potential areas for initiatives aimed at reforestation by natural regeneration.

6. Conclusion and next steps

The maps and the statistics presented in this report highlight the large potential for synergies between REDD+ and the Aichi Biodiversity Targets at the regional level. REDD+ actions, based on forest conservation through extending and enhancing the effectiveness of representative networks of protected areas, may contribute to Aichi Target 11. REDD+ initiatives based on sustainable management of forests through developing and implementing sustainable land-use plans and certification may contribute to Aichi Target 7. REDD+ initiatives based on reforestation and forest restoration may contribute to Aichi Target 15 on the restoration of degraded ecosystems.

By providing information on priority areas for endangered species or the provision of ecosystem services, spatial analysis can also highlight the synergies between REDD+ initiatives to protect or restore forest cover and Aichi Targets 12 and 14 on preventing the extinction of endangered species and maintaining ecosystem services. The modelling component of the REDD-PAC project should produce spatially explicit information on where pressures from land use conversion on forest are highest. This information could help identify where REDD+ actions are most needed to reduce deforestation and degradation, and can thereby contribute to Aichi Target 5 on the reduction of loss of natural habitats, including forests. Such modelling will also allow for a comparison of different scenarios of REDD+ implementation in their impacts on land use, biodiversity and ecosystem services.

Spatial analysis is of particular relevance in the context of COMIFAC countries, whose legislation includes, in most cases, provisions for land-use planning and zoning of forests for different uses. Going forward, a declination of the type of static analysis such as presented in this report at national level, with the addition of national data, could also be relevant for inclusion in REDD+ strategies and in NBSAPs. While COMIFAC countries are refining their REDD+ strategies at national and sub-regional levels, spatial analysis could also support the development, selection and implementation of appropriate REDD+ initiatives that, take account of local contexts, address the REDD+ safeguards and take advantage of the synergies with CBD targets. By establishing geographical priorities, it would allow more effective planning of initiatives to implement these two international commitments.

Repeating this type of spatial analysis at regular intervals could also allow the monitoring of the implementation of these commitments at the national level, helping with the provision of information to the Secretariats of the two Conventions involved, the UNFCCC and the CBD. Finally, such periodicity applied to regional level analysis, as presented in the report, could also support the monitoring and implementation of regional policies, such as the COMIFAC Convergence Plan.

Dzanga-Ndoki National Park, Central African Republic by Peter Prokosch © 2013 GRID-Arendal

7. Annexes

7.1 Annex I - Methodology and data used for the calculation of species richness and biodiversity importance.

The spatial analyses on species diversity were made from data sets obtained from the IUCN, BirdLife International, and NatureServe (data from 2013). Species richness (Maps 2, 3, 7) was calculated using species ranges. These ranges reflect the occurrence of species in their natural habitats, for taxonomic groups for which data are available. Occurrences correspond to validated observations or estimates of presence in terms of knowledge on habitat quality and ecology of the species. The species richness maps presented in this report include mammals, amphibians, reptiles, birds, and aquatic species from mangroves and freshwater. The calculation of richness is derived by summing, on a given unit area, the number of species ranges that overlap with this unit. The unit used in the maps is produced by dividing the overall area of the sub-region of 50 km by 50 km (250,103 ha) in a regular grid corresponding to the spatial unit of analysis used by the GLOBIOM model ('COLROWS'). The ranges for each species are compiled and their presence listed in each of the units of the grid (see figure below). The sum of the range that coincides with each COLROW gives an indication of its richness in species, as illustrated below with the ranges of two species.

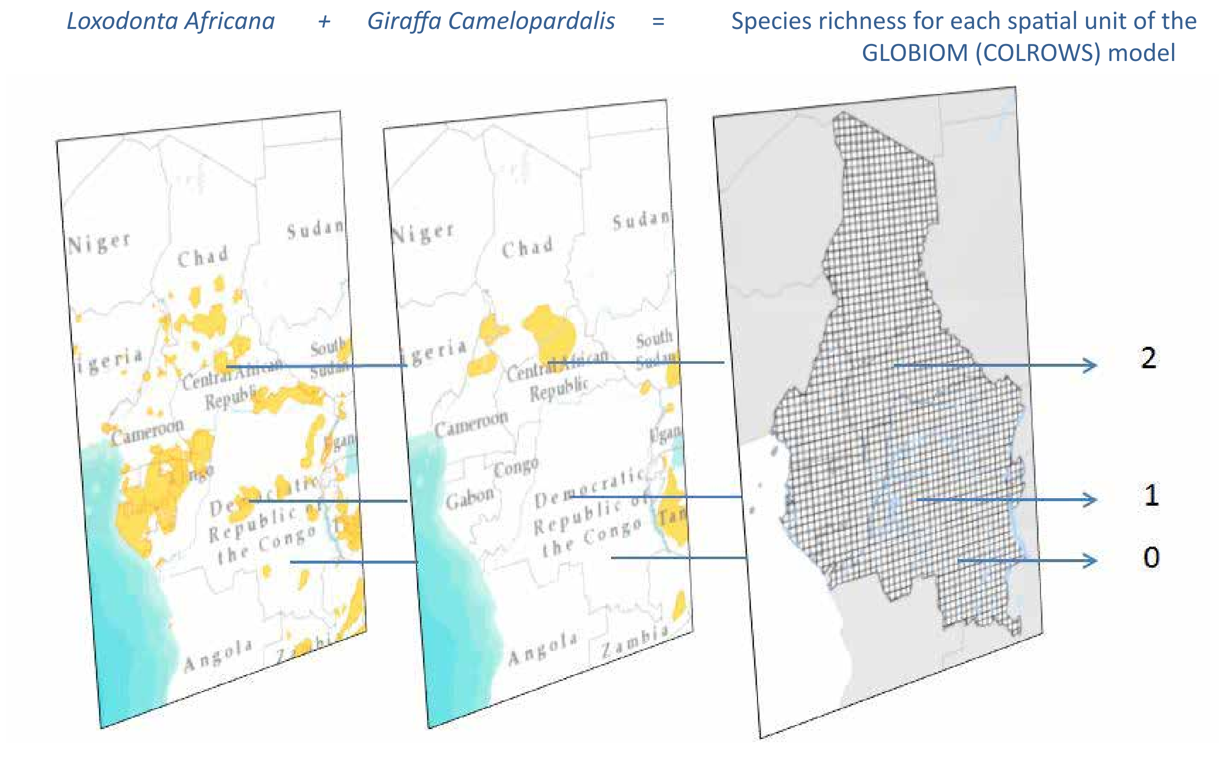
The species importance index (Maps 4, 12 and 13) takes into account the proportion of the area of each endangered species in a given spatial unit (overlap) in relation to its total area in the region (limits of the 10 COMIFAC countries). The proportions are then summed for all species considered in order to obtain the final value of the index of importance.

This method therefore takes account not only of species richness but also of species endemism: if a species has a limited distribution to a given unit then that is particularly important for its conservation.

7.2 Annex II – Biomass carbon

Data collected on the carbon density come from several sources and consider both carbon from aerial biomass (vegetation: stems and crowns) and below-ground biomass (vegetation: roots and soil organic matter). Data on aboveground biomass come from a pan-tropical remote-sensing dataset based MODIS NBAR data at a resolution of 500 meters (Baccini et al 2012.). Each pixel of 500 m x 500 m contains a value for the biomass density in tonnes per hectare (t/ha). The calculation of the values for belowground biomass is an estimation applying a specific root-to-shoot ratio on the aerial biomass data in different ecosystems (FAO 2006). The mass of carbon was deduced from those biomass results (0.5 coefficient). The data is displayed on Map 1 using a distribution of values of the carbon density categorized by quintiles.

Baccini *et al.* (2012) have improved the accuracy of their data through verification using field experiments. However, given that the data from remote-sensing was collected during 2007-2008, it is uncertain whether the current condition of forests can be estimated very precisely using this data. It is possible that certain situations (especially concerning degradation and deforestation) have evolved. The resolution may also be insufficient for analysis below the national or sub-regional



scale. Data collected from national forest inventories should ultimately help to refine these analyses. It should be noted that the analysis does not include soil carbon, and therefore does not include all the carbon pools that may be affected by deforestation or degradation.

7.3 Annex III - Forest cover and forest cover loss

Data on the loss of forest cover comes from the Global Forest Watch (Hansen *et al.* 2013). This data is derived from a time series of twelve years (2000-2012) of remotely sensed data (Landsat) with a resolution of 30m. Data on forest cover is for 2000, with each pixel of the map corresponding to a value of tree cover in percentage (%). The trees are considered all vegetation above 5 meters height. For the representation of deforestation (Maps 1, 8-11, 12, 13), each red pixel represents a deforested area between 2000 and 2012. Deforestation is defined as a disturbance of the area leading to a total loss of canopy coverage.

7.4 Annex IV – Potential soil erosion from forest cover loss

The map of the potential soil erosion in Democratic Republic of Congo has been prepared with data obtained through the WaterWorld model. This modelling takes into account a number of variables expressed spatially: the degree of slope, runoff, determined based on weather patterns, and soil cover . According to the empirical model of Thornes (1990) used for the modelling, erosion can be calculated as a function incorporating parameters such surface runoff, the degree of slope and vegetation cover, using the equation:

$$\text{Erosion} = K*(\text{runoff}^m)*(\text{slope}^n)*(e^{(-00.7*\text{vegetation cover})});$$

with K, m and n constants after Musgrave (1947). To produce the map, the soil erosion in the current conditions was compared to a scenario of total loss of forest and vegetation cover, modelled by assigning values of 0% for the cover of the trees and grasses and 100% for the bare soil surface. The current vegetation cover was determined on the basis of MODIS 2010 remote sensing data.

This map thus represents areas with the greatest risk of erosion in the event of total loss of vegetation cover, and therefore a priori more sensitive to deforestation and/or degradation. Data is presented only within the limits of the existing forest cover (for both dense humid forest and woodlands) and therefore identify areas where the potential for ecosystem service control soil erosion played forests is the most important. This service is however only potential until it is of actual use. The importance of maintaining forest cover to control soil erosion depends not only on biophysical variables, but also socio-economic variables, not shown on this map. A more accurate assessment of the importance of this service would therefore require spatial data infrastructure (dams, roads, waterways) and land use (agriculture in particular) to be collected, in order to see how they may be affected by such erosion.

7.5 Annex V – Funding for REDD+ in COMIFAC countries

The Voluntary REDD+ Database (http://reddplusdatabase.org/) contains information on REDD+ funding, initiatives and policy results all over the world. Set up by the REDD+ Partnership, since 2010 it has gathered data submitted on a voluntary basis by the member states of the Partnership and partner institutions.

According to information supplied by donor countries, the latter have supported the setting up of REDD+ initiatives in COMIFAC member states to the tune of US$ 389 million[7]. This funding is the subject of 132 arrangements between COMIFAC countries and donor countries, including France (US$37 million), the European Commission (US$28 million) and Canada (US$23 million). The largest funds come from multilateral institutions: Global Environmental Facility (US$98 million),

The Democratic Republic of the Congo is by far the country gathering the most funding, with nearly US$ 195 million reported by donor countries, followed by Cameroon, the Central African Republic and Gabon. Many projects are carried out at regional level in the Congo Basin and therefore affect all of the COMIFAC countries. The funding is spread out over a period from 2007 to 2018, but is essentially concentrated between 2010 and 2012. It is important to note that the low sums reported for 2014 onwards do not automatically mean a slowdown in funding for REDD+ but are largely due to the way in which the information is entered in the database, mainly retrospectively.

Four COMIFAC countries have reported domestic sources of funding for REDD+, namely Chad, the Democratic Republic of Congo, Gabon and Congo, totalling almost US$6 million. Nine COMIFAC countries have entered information on the voluntary REDD+ database reporting funding of around US$154 million. The discrepancy between the funding reported by donor countries and recipient countries may be explained by the fact that there is no official definition at international level of what comes under REDD+ or not. Thus, some arrangements that appear on the database indirectly support the implementation of REDD+. They focus, for example, on conserving forest biodiversity or improving the network of protected areas which are elements to take into account as part of REDD+ environmental safeguards.

[7] Data downloaded on 28 April 2014

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Western Lowland Gorilla © Uryadnikov Sergey (licence Shutterstock)

Mapping and spatial analysis can support planning for REDD+ actions in a manner that contributes to the achievement of the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets. This potential for synergies is presented here in the political and institutional context of member countries of the COMIFAC, the Commission for Central African Forests. Relevant spatial data is introduced, as well as ways to analyse it for the joint implementation of these two international commitments. This contribution of spatial analysis is then explored in more detail for three main types of REDD+ actions relevant to the sub-region, and found in the majority of REDD+ strategies of the COMIFAC countries: REDD+ actions for the conservation of forests, REDD+ actions for sustainable forest management and REDD+ actions for reforestation and forest restoration.

The analysis presented in this report could contribute to a better consideration of the potential for synergies between REDD+ implementation and the multiple benefits related to biodiversity and ecosystem services of forests in the development of national and regional REDD+ strategies. Conversely, it could support the inclusion of REDD+ consideration in the development of National Biodiversity Strategies and Action Plans in Central Africa. Finally, it could also inform the implementation of regional strategies for the sustainable management of the Congo Basin forests such as the COMIFAC Convergence Plan.

Contact:
UNEP World Conservation Monitoring Centre
219 Huntingdon Road
Cambridge, CB3 0DL, United Kingdom
Tel: +44 1223 814636
Fax: +44 1223 277136
E-mail: climate@unep-wcmc.org
www.unep-wcmc.org

Supported by:
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
based on a decision of the German Bundestag