Data Review and gap analysis to improve availability and use of data for planning mitigation activities by industry and development projects

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Component 2 of the COMBO project is about developing tools and methods for assessing biodiversity values, characterizing and quantifying impacts, and offering guidance on using this information for mitigation (avoidance, minimization, restoration and offsetting).

The aim of the component was to identify data that can be used to apply good mitigation practice, as indicated in the guidance for baseline studies and mitigation design produced by IFC (PS6 guidance notes), CSBI (sectoral guidance), IUCN (Key Biodiversity Areas), and BBOP (mitigation hierarchy and offsets).

The data was prioritized in order of importance (Low- High) and how is or difficult it was to access the data. Whereas most of the required data is available, some key datasets in the ecosystem services, land use and people theme still lack data. Where possible, the available scanty data for the region of interest will have to be used or fresh data collected. Generation of some datasets, like for the land use plan, will require consent from the mandated institution.

Several data storage centres exist but they are all at institutional level. Effort has been made to develop national level spatial data infrastructure but with no success. The nearest to aggregated data is found at the National Environment Management Authority where a landscape level storage portal has been developed and at the Biodiversity data bank housed in Makerere University where national level data for the biodiversity thematic area is stored. To support data storage infrastructure in Uganda, there will be need to evaluate the potential of the existing web portals and identify one that can be supported for expansion.

1 Introduction

The Wildlife Conservation Society, Forest Trends and Biotope have commenced a four-year project (2016-2019), Conservation impact mitigation and biodiversity offsets in Africa(COMBO), which aims to reconcile economic development in Africa with conservation of biodiversity and ecosystem services. This project is funded by the Agence Francaise de Développement (AFD), the Fonds Français pour l'Environnement Mondial (FFEM) and the Mava Foundation. It will build capacity to reduce the impacts of development projects on biodiversity.

The COMBO project is following the no net loss principles and guidance of the Business and Biodiversity Offsets Program (BBOP) and BBOP Standard, the International Finance Corporation (IFC) Performance Standard 6, the World Bank's Environmental and Social Safeguards (e.g. ESS6), Equator Principles, and other best practice policies and methodologies. As these principles and standards have received widespread review by a range of stakeholders, this approach will facilitate the improved application of the mitigation hierarchy globally.

1.1 Component 2 of the COMBO project

Component 2 of the COMBO project is about developing tools and methods for assessing biodiversity values (e.g. identifying priority features, mapping biodiversity, key biodiversity areas, critical habitats, etc.), characterizing and quantifying impacts (mapping direct and indirect impacts, modelling effects on population viability, etc.), and offering guidance on using this information for mitigation (avoidance, minimization, restoration and offsetting).

The study will be carried out at two spatial scales: national and landscape scale. At the national scale, the tools developed will inform national mitigation planning and policy development. At the landscape scale, the tools will be used to guide implementation of the mitigation hierarchy. To understand trends in biodiversity and land-use, temporal scales will also be considered.

"Demonstration landscapes", in which to develop and test tools and methods, will also be identified. These should be areas where development activities that may require application of the mitigation hierarchy are occurring, and have reasonably adequate data to carry out the required analysis.

A first key step of this activity was each country to undertake a thorough review and gap analysis of the available and accessible spatial and non-spatial data that is required for mitigation planning and decision-making. This document outlines how this data gap analysis will be conducted.

1.2 Outline report

This report briefly presents the background on component 2, aims of the study, data periodization and analysis. It further gives the discussion and recommendations from the survey.

1.3 Aims of this study

The focus of the study was to identify data that can be used to apply good mitigation practice, as indicated in the guidance for baseline studies and mitigation design produced by IFC (PS6 guidance notes), CSBI (sectoral guidance), IUCN (Key Biodiversity Areas), BBOP (mitigation hierarchy and offsets). These data include data on species, habitats and ecosystems, ecological processes, as well as, other useful information on e.g. land cover and land use, wildlife uses and ecosystem services. These data are to be used to support mitigation planning and decision-making according to good practice. COMBO intends to produce guidance on how to collect, organize, share and use such data. This study is a first step in developing this guidance.

The role of data and information in mitigation planning, including offsets

The design and application of law and policy on the mitigation hierarchy, including biodiversity offsets, relies in part on sound biodiversity information and data and knowledge management systems. For instance, a certain depth and quality of biodiversity data is needed to support the following key (interlinked) activities:

- Determine biodiversity type, condition and conservation significance (i.e. making decisions on how best to represent biodiversity, or components of biodiversity – e.g. surrogates)
- Conduct meaningful landscape-level assessment and planning (i.e. compiling and analysing spatially explicit information to underpin planning and decision-making on biodiversity in the landscape)
- Enable proper assessment of impacts caused by development projects
- Apply the mitigation hierarchy at various scales, particularly in terms of areas where impacts should be avoided, defining limits to what can be offset, identifying suitable offset sites and activities.
- Defining exchange rules in offsetting (i.e. the kind of biodiversity, conservation activities and locations that are considered a fair exchange for residual losses)
- Defining metrics (i.e. how to quantify biodiversity losses and gains, including issues such as defining a currency, defining a frame of reference and baseline/ counterfactual against which to measure losses and gains, etc.)
- Define what is considered additional or 'over and above' outcomes that would have happened anyway (i.e. frame of reference, baselines/counterfactuals: especially if offset activities might be considered within (existing) protected areas)
- Undertake monitoring, evaluation and enforcement of mitigation measures.

The following kinds of data sets and information resources are required for these activities:

- Biodiversity baselines, trends and trajectories (e.g. rates of forest decline due to deforestation or degradation over time, rates of increase due to regeneration and restoration, and presence of priority biodiversity)
- Land cover and land use data: current situation, trends and predictions/ plans
- Land ownership, administration and land use rights data
- Conservation targets, goals and plans

1.4 Data prioritisation

To help prioritize the data required for this activity, each potential dataset was given a priority/importance ranking (Appendix 1) that should help allocate time and give the right output. The data is prioritised according to the order of importance ranging from Very high, through high, medium to low. Level of accessibility ranges from very hard to very easy. Species that are critically endangered, extent of ecosystems and protected area land use are ranked 'very high'. Species of restricted range and endemic species and terrestrial ecosystem condition, aquatic ecosystems; ecosystem services provisioning, regulatory and cultural services are ranked 'high'.

Importance	Scale	Difficulty to find	Scale
Very high	Essential for mitigation planning	Very hard	Unlikely to be easily found
High	Important for mitigation planning	Hard	Can sometimes be found
Medium	Useful but not essential for mitigation planning	Easy	Data typically exists, at least as a proxy
Low	Not essential for mitigation planning	Very easy	Quite readily available

1.5 Methodology of data gap analysis

Review of existing data

The first step was to carry out a review of the existing data (spatial datasets as well as non-spatial information) using Appendix 1 and 2 as a guide for the types of data to look for. This was a desk-top review of available datasets and potential data holders. Consultation with relevant data holders and specialists was carried out through a meetings held on the 9th of December 2016. For the relevant data holders who were not able to attend the meeting, consultation was carried out through opportunistic interviews during other meetings organized by WCS.

Readily accessible datasets (including datasets known and managed by project partners) were identified first. To help prioritize the data required for this activity, each potential dataset was given a priority/importance ranking (Appendix 1 and 2).

Detailed information on the spatial datasets and other information have been recorded in a separate table (Metadata on datasets_19May2017) accompanying this report (based on Appendix 3). Regular communication with the COMBO team and other key partners was essential during the gap analysis. Because of WCS Uganda's continued support to government activities, there were several datasets that the GIS and remote sensing personnel had already obtained from government institutions. For the data available at the WCS office, information on storage location has also been indicated in the table.

Table 1. Data availability and location

Attribute	Name	Source/ owner (contact)	Availability	Location
Land cover	uga lb_veg	Digitized from an original hard copy	Not Applicable	(Lacie_small) J:\Back up\sensitivity atlas\Lbrown
Land cover	Landcover_ues 2005_WGS84	National Forest Authority: mapping department	Purchased or obtained under an MOU	(Lacie (big) Storage) M:\Country datasets\2005 Land Cover
Land cover	Landcover_ues 2015_WGS85	National Forest Authority: mapping department	Purchased or obtained under an MOU	(Lacie (big) Storage) M:\Country datasets\2015 Land Cover
Land cover	Modified_habitat_July_16, Natural_habitat_July_16	PEPD	use permission provided by PEPD	(Lacie_big_Grace) O:\Tullow_Phase 2_biodiversity_ submitted\VOLUME TWO - CRITICAL HABITAT ASSESSMENT AND ANNEXES\CHA DMU boundaries .gdb
Land cover	UgandaWetlands	Wetlands Management Department	Freely available	(Lacie_big_Grace) M:\Wetlands_data
Boundaries	Africa_drainage	Water resources department	Freely available	(Lacie_big_Storage)M:\Africa\river basin\ Africa_drainage (Extracted from Hydrosheds http://hydrosheds.cr.usgs.gov/index.php
	Africa_drainage	Water resources department	Can be modeled. River layer available, water yield can be obtained from Wetland Department	
Cover layer	The national layer is being prepared by Wetlands Management Department. I do not yet have the exact name of the map. eCountability prepared an output for Murchison-Semliki landscape	Water resources department?	After obtaining permission	

Point map and tables	All taxa lists----edit	WCS, Government	Some available at WCS. Others available from taxa experts	https://wcs1-my.sharepoint.com/personal/sayebare_wcs_org/_layouts/15/WopiFrame.aspx?sourcedoc=%7BDFE48A76-208D-4771-8D57-EDBF67DA0D58%7D&file=All%20Taxa%20lists%20—edit.xlsx&action=default
Point map and tables	All taxa lists----edit	WCS, Government	Some available at WCS. Others available from taxa experts	https://wcs1-my.sharepoint.com/personal/sayebare_wcs_org/_layouts/15/WopiFrame.aspx?sourcedoc=%7BDFE48A76-208D-4771-8D57 EDBF67DA0D58%7D&file=All%20Taxa%20lists%20—edit.xlsx&action=default
Point map and tables	All taxa lists----edit	WCS, Government	Some available at WCS. Others available from taxa experts	https://wcs1-my.sharepoint.com/personal/sayebare_wcs_org/ layouts/15/WopiFrame.aspx?sourcedoc=%7BDFE48A76-208D-4771-8D57 EDBF67DA0D58%7D&file=All%20Taxa%20lists%20—edit.xlsx&action=default
Point map and tables	All taxa lists----edit	WCS, Government	Some available at WCS. Others available from taxa experts	https://wcs1 my.sharepoint.com/personal/sayebare_wcs_org/ layouts/15/WopiFrame.aspx?sourcedoc=%7BDFE48A76-208D-4771-8D57 EDBF67DA0D58%7D&file=All%20Taxa%20lists%20--edit.xlsx& action=default
polygon map	uga_national_parks,Uga_Wildlife_Reserves, Uga_community_wildlife_areas, Forest_Reserves_UG	UWA and NFA	From responsible institutions	(Lacie_big_Grace) M:\UGA\Protected areas
polygon map	Uganda_districts_2014	UBOS	Freely available	(Lacie_big_Grace) M:\UBOS\Geo-Information Management Working Group, Nov 27, 2014
Line map	uganda road network	UNOCHA	Freely available	(Lacie_big_Grace folder) M:\Country datasets
Population density	Uganda_Subcounties_2014_Ver3_0_UTM36S	UBOS	Freely available	(Lacie_big_storage folder) M:\UBOS\GeoIMWG-June 20, 2016\Uganda_Subcounty_2014
Report and associated data	The value of Uganda's forests: a livelihoods and ecosystems approach			Simon nampindo

Table 2. Consultations

S/N	Name	Position/Institution	E-mail	Phone number
1	Carol Nakalyango Wafula	MWE-DWD	caroline.nakalyango@gmail.com	0755 890250
2	Dismus Mbabazi	NAFRI	mbabazidismas@yahoo.com or mbabazidismas@gmail.com	0772 393452
3	Magezi Akiiki	Meteorology	mageziakiikibj@yahoo.co.uk	
4	Herbert Tushabe	Makerere University Biodiversity Data Bank	htushabe@caes.mak.ac.ug htushabe@gmail.com	0777 564295 or 0703 046791
Individual consultations-				
1	John Diisi	NFA	johnndiisi@gmail.com	0772 410523
2	Fred Wanyama	UWA	wanyama@Ugandawildlife.org	0772 644705
3	Moses Isabirye	Busiitema University	Isabiryemoses@gmail.com	0772 885692
4	Kato Phillip	NEMA	pkato@nemaug.org	0704 022276

The presentations made the already availed list of required datasets generated a number of discussion points.

1. There were some themes missing from the table. These include
    a. Genetic data
    b. Climate change information
2. As much as we want to forecast impact of development, we should also consider historical data for it can be used to trace changes in rates of decline of a specific resource.
3. Need for defining some of the terms used e.g. disturbed land for it can be negative or positive.

2 Results from the analysis

Most of the data required for this project is available. The Terrestrial ecosystem is well covered and useful to analyse trends data is available for an interval of10 years and available since 2005. National forest Authority is the source data. The data was produced from the parent image of 30 m.

The aquatic ecosystems data layers are watersheds, wetland and hydrology. The watershed is extracted from African drainage data set which is freely available.

The species data is classified as;

- critically endangered,
- endangered,
- restricted range species,
- least concern species
- migratory routes,
- aggregation sites and seasonal concentrations

Gaps are mainly in the land use and ecosystem services section. Some of these layers are missing just because the mandated institutions have been reluctant to develop them.

Most of the ecosystem service components have been assessed for only the Murchison-Semliki landscape.

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2.1 Limitations on databases and people consulted

Data storage

There is no data storage system/platform at the national level. A few institutions e.g. wetland management department and Water Resources Department have developed databases to hold the institutional data. Others store data for a specific theme e.g. Biodiversity data bank that stores biodiversity data. There has also been effort to store data of all categories for specific landscapes e.g. the Albertine Graben, which covers Murchison-Semliki landscape, is hosted at NEMA. National level data storage efforts have consistently collapsed before they are completed. Botanical gardens, National council for science and technology, and National Planning Authority have all made an attempt at developing national databases.

2.2 Discussion

The available data has been generated over time by various institutions based on their need to assess variables in a landscape or to monitor the resource. Datasets required for this analysis, which have otherwise not been a priority for the responsible institutions, are the ones that are not available. The probable assumption for not collecting such data e.g. ecosystem service data was that as long as the resource is well managed, it will continue supplying the services.

Some of the ecosystem services e.g. provisioning services have been studied in piece meal form. Most studies are carried out at local scale i.e. most accessible data is at forests or lake level (NaFIRRI, 2011). National studies are hard to find. At a landscape level, ecosystem services have only been comprehensively studied in the Albertine Graben in preparation for oil development. Fisheries Department has carried out studies for most of the lakes most of the time focusing on the statistical figures with less attention paid on the spatial component of the data collection (personal experience of processing fisheries data). Fisheries nationally compiled statistics can be accessed in the national statistics abstracts e.g. UBOS 2012, UBOS, 2013)

One of the major data gaps is in the area of land use. Although the land use policy is in place (The Republic of Uganda, 2006), the institution responsible for developing land use plans (National Planning Authority) has instead developed physical plans e.g. Ministry of Lands, Housing & Urban Development (2015). They indicate that the land use of each area for which a physical plan was generated was considered during the development of the physical plan. Developing a land use plan for Uganda will, therefore, require special negotiation. The conservation and management plans only exist for protected areas.

In the people section, the impact of projects on people, pollution and pollution risk, and development corridors lack data.

Although there exist several data storage centres, none of them is at national scale. All effort to develop a national data infrastructure, attempted by various institutions, have collapsed due to various challenges including conflicting mandates, lack of adequate funding to sustain the infrastructure and vision bearer transfer to other institutions.

2.3 Recommendations and next steps

- WCS will need to work with the mandated institutions, where possible, to generate the missing information
- For layers that the responsible institutions have not generated and yet they are crucial for this assessment, WCS will need to hold discussions with such institutions to highlight the importance of these layers for resource management purposes
- For the data, which WCS does not have in-house, access will have to be achieved through development of MoUs or other forms of agreements. Ways of generating outputs that may be beneficial to the data holding institution will have to be explored.
- For datasets that occur in piece meals, mapping of all institutions and individual experts that may host some of the data will have to be carried out. Effort should them be made to reach out to those institutions.

- Although data exists, combining it for use in a single product is usually cumbersome because of the varied standards, level of accuracy, projections in which they were developed. Also a large number of datasets lack metadata.
- WCS will need to consider working with institutions that already have web portals to ensure that all available data can be accessed from a one-stop centre. This will require evaluation of existing portal centres in terms of institutional mandate, what data they hold, data user access protocols that are in place or can be developed and financial requirement for the maintenance of the portal.

References

Ministry of Lands, Housing & Urban Development, 2015. Physical development planning of the Albertine Graben region

NAFIRRI 2011. Fisheries catch assessment surveys (CAS) information, Uganda 2005-2011.

The Republic of Uganda, 2006. The National Land Use Policy. Ministry of Lands, Housing and Urban Development

UBOS, 2012 Statistical Abstract. Uganda Bureau of Statistics, Statistics house

UBOS, 2013. Statistical Abstract. Uganda Bureau of Statistics, Statistics house

Appendix 1: Data collection guidance

Theme	Attribute	Notes and examples	IFC and/or other significance criteria	Importance / Difficulty to find*	Potential global sources	Potential national sources
Terrestrial ecosystems	Ecosystem type classification and map (showing potential or 'original' extent of ecosystems).	Make good biodiversity surrogates, more easily mapped than species, ideally have some baseline. These types of layers will be available at different scales and will be based on some way of classifying the landscape according to ecological criteria. Examples are ecoregions and biomes at the broad scale, or vegetation types, which may be mapped at coarse or finer scales.	Many might meet IFC natural habitat if not modified. Rare or threatened ecosystems can be IFC critical habitat. If threatened can be KBA. Could meet HCV 2 &3.	Very high/Easy	Ecoregions http://wwf.panda.org/about_our_earth/ecoregions/about/	Check Ministry/ Department of Environment and resource management agencies
Terrestrial ecosystems	Land cover (showing extent of current natural areas). Examples are usually classified remotely sensed images that show broad	This type of layer shows different types of land cover/ uses, including the extent of natural ecosystems. When combined with an ecosystem classification layer (as above), it indicates how much of each type of ecosystem remains at a specific point in time. Note: individual layers may also exist showing specific types of systems or habitats, e.g. of 'coastal forests', or 'mangrove forests' etc.	Many might meet IFC natural habitat if not modified. Rare or threatened ecosystems can be IFC critical habitat. If threatened can be KBA. Could meet HCV 2 &3	Very high/Easy	Globcover http://due.esrin.esa.int/page_globcover.php Global forest watch http://www.globalforestwatch.org	Check Ministry/ Department of Environment and resource management agencies

Terrestrial ecosystems	Ecosystem condition or integrity	These could be spatial layers or systems used to classify condition[1]. This could include factors like degradation, fragmentation, invasive species, defaunation etc. Also good to identify intact areas with high ecological integrity. Ideally on a condition scale e.g. values between 0-1.	Good to help with accounting gains and losses beyond measures for IFC natural habitat.	High/Hard	Could be it on landcover and assumptions around edge effects etc. Intact forests can be found here http://www.intactforests.org.	
Marine ecosystems	Marine ecosystems	This may be spatial layers (point or polygon data) that serve as an indicator of ecosystem condition for any ecosystem type (e.g. coral reef, seagrass habitats) OR a system (non-spatial) that sets out such a classification acc. to different criteria or indicators.	Many might meet IFC natural habitat if not modified. Rare or threatened ecosystems can be IFC critical habitat. If threatened can be KBA.	Very High/Easy	WCMC http://data.unep-wcmc.org	
Marine ecosystems	Condition of marine ecosystems (e.g. water quality data)	Current and past data if possible; this includes dissolved inorganic nitrogen (DIN), suspended fine sediment, but could also include pesticides, herbicides or any other water quality indicators available	Good to help with accounting gains and losses beyond measures for IFC natural habitat.	High/hard		

[1] NB: these condition/ integrity systems and descriptors could be 1) site-based (e.g. a system for measuring aquatic condition at a particular site) and/or 2) relevant to the entire ecosystem (e.g. threat status of rivers or vegetation types in the country, according to various criteria such as 'amount remaining', 'fragmentation levels' etc.)

Aquatic ecosystems	Locations of wetlands. Where possible types of wetlands.	Make good surrogates for component biodiversity and function, more easily mapped or determined than species. Wetlands are usually very important from both a conservation and ecosystem service perspective.	Could be IFC natural habitat, could also be critical habitat if containing migratory and congregatory species.	High/Easy	Check for RAMSAR site http://ramsar.wetlands.org/Database/AbouttheRamsarSitesDatabase/tabid/812/Default.aspx Potential wetlands can be based on digital elevation models.	
Aquatic ecosystems	Limits of watersheds	Needed to frame mitigation, e.g. offsetting wetland loss within the same watershed.		High/Easy	Hydrosheds http://hydrosheds.cr.usgs.gov/index.php	
Aquatic ecosystems	Watersheds and hydrology	Understanding watersheds that link terrestrial ecosystems and aquatic ones can be useful. Often based on indicators like water yield of vegetation, or water quality and flow of rivers can be useful. Linked to ecosystem services modeling noted below.	Could be input to mapping IFC priority ecosystem service.	High/Easy	Based on a hydrological models like Invest, SWAT and Waterworld (this is available globally).	
Aquatic ecosystems	Aquatic ecosystem condition or integrity	This may be spatial layers that serve as an indicator of ecosystem condition for any ecosystem type (e.g. wetland, estuary, mangrove forest) OR a system		High		

		(non-spatial) that sets out such a classification acc. to different criteria or indicators.				
Species	Critically endangered species (Freshwater, marine and terrestrial)	Can be point, modeled or ranges. Models are generally best for broader scale risk assessment, survey data best for EIA. It might be necessary to understand distribution or abundance globally if following IFC tiers.	IFC critical habitat. KBA criteria. HCV 1.	Very High/Hard	For species www.iucnredlist.org. See IBAT for Key Biodiversity Areas. AZE sites here http://www.zeroextinction.org. BirdLife Inernational	National Red List
Species	Endangered species (Freshwater, marine and terrestrial)	Can be point, modeled or ranges. Models are generally best for broader scale risk assessment, survey data best for EIA It might be necessary to understand distribution or abundance globally if following IFC tiers.	IFC critical habitat. KBA criteria. HCV 1.	Very High/Hard	For species www.iucnredlist.org. See IBAT for Key Biodiversity Areas. BirdLife International	
Species	Species in other threatened categories (Freshwater, marine and terrestrial)	Can be point, modeled or ranges. Models are generally best for broader scale risk assessment, survey data best for EIA	Can be IFC critical habitat in certain circumstances. HCV 1.	High/Hard	See IBAT for KBAs BirdLife International	

Species	Restricted-range species (Both marine and terrestrial)	IFC uses 50000km2 or less as a restricted range threshold. KBA criteria somewhat different.	IFC critical habitat. KBA criteria. HCV 1.	High/Hard	BirdLife International	
Species	Migratory routes, aggregation sites, and seasonal concentrations	IFC guidance notes has good information on this.	IFC critical habitat. KBA criteria. HCV 1.	High/Hard	BirdLife International	
Species	Keystone species	A keystone species is a species that has a disproportionately large effect on its environment relative to its abundance	Can be IFC critical habitat in certain circumstances.	Medium/Hard		
Species	Sites supporting biological processes	Geographic locations of ecological and evolutionary processes. Demographic processes (e.g. spawning or nursery sites), ecological refugia, places important for landscape connectivity, recruitment sources. Good to link to KBA criteria.	KBA criteria. Could meet HCV 3.	Medium/Hard		
Ecosystem services**	Provisioning ecosystems services (e.g. fisheries, forestry, NTFP)	Priority ecosystem services that are locally important natural resources. Fisheries catch data – could be based on catch tonnage or catch per unit effort (CPUE) Data on production or harvest of NTFP	Could be IFC priority ecosystem service. HCV 4-5.	High/Hard	Contract government natural resource management agencies.	

		This is usually only available at a very rough scale. Info with some degree of detail (importance for local communities) can only be assessed using focus groups for example				
Ecosystem services**	Carbon (Regulating services)	Global datasets on carbon are available. Ideally more local data is available though.		Very High/Easy	Several carbon data exist. Best global is likely Avitabile et al. (2016) https://carbonmaps.ourecosystem.com/interface.	
Ecosystem services**	Other Regulating services	Examples include maintenance of water quantity and quality, erosion and sediment retention, carbon storage and sequestration	Could be IFC priority ecosystem service. HCV 4.	High/Hard	See above on watersheds and hydrology.	
Ecosystem services**	Cultural ecosystem services	For example locally important cultural sites to communities. This is usually only available at a very rough scale. Info with some degree of detail (importance for local communities) can only be assessed using focus groups for example	Could be IFC priority ecosystem service. HCV 6.	High/Hard	Difficult to identify existing data.	
Land use	Protected areas and their specific designations (e.g. National		Can be critical habitat depending on management category.	Very high/Easy	Protected planet http://www.protectedplanet.net	

	Park, private nature reserve, game farm, etc.)					
Land use/ plans	Conservation plans and priorities	This might include a range of different spatial layers used for a prioritization exercise, as well as outputs. Important layers would for example show areas (and actions) identified as important for conservation are important considerations for avoidance and potential offset sites. Preferably identified through a formal process with participation from stakeholders and ideally based on data.	Important areas can be critical habitat and/or KBAs	Very high/Hard		
Land use	Tenure and institutional arrangements	For example, if an area has private, communal or is public lands		Very High/Hard		
Land use	Management	Land management, production activities like agriculture. This might be easier for identifying at the landscape scale, rather than the country scale (e.g. in Mozambique).		Very High/Easy		
Land use	Designation of land use rights	Logging and plantation concessions Mining (exploration and exploitation) concessions Etc.		High/Hard		Usually from the relevant govt ministry or department

Land cover/land use change	Land cover change risk	Risk of future landcover change usually based on the assessment of actors and drivers of landuse change. Tool is used commonly for REDD+ baselines. This can help with measuring additionally and avoided loss.		Very High/Hard		
People	Population	Density of people, if possible measuring the socio-cultural attributes like indigenous people, purchasing power (PPP).		Very high /Easy	See http://sedac.ciesin.columbia.edu/data/collection/gpw-v3. Remotely sensed nighttime lights http://ngdc.noaa.gov/eog/night_sat/nightsat.html	
People	Infrastructure	Roads, railways, navigable rivers, shipping routes, urban centres, electricity transmission lines etc.		Very High/Easy		
People	Development corridors	These corridors drive development across much of Africa.		High/Easy		
People	Pollution and pollution risk	Existing polluted areas and areas potentially at risk from industrial activity (e.g. shipping & transport, pipelines, industrial sites, tailings dams etc.)		Medium/Hard		

People	Human-pressure	Composite metrics that explore the cumulative impacts of different threats on biodiversity. Note that this can be used as a proxy for ecological condition.		High/Easy	Human footprint http://datadryad.org/resource/doi:10.5061/dryad.052q5.	

Appendix 2: List of priority data types

Component	Data availability	Coverage	Data layer host
Terrestrial ecosystems	All required data is available	- Three of the four documents have national coverage - One covers only the Murchison-semliki landscape	WCS, Uganda office
Aquatic ecosystems	- Wetland coverage and for watersheds are available - Hydrology can be modelled from available datasets - Condition or integrity layer is not available	Wetland coverage and for watersheds have national coverage	WCS, Uganda office
Species	- Globally and nationally critically endangered, Endangered, threatened and restricted range species information is available or all taxa - Seasonal concentrations available for lions and elephants Keystone species not identified but survey data available for all species - KBAs that could inform sites supporting biological processes have been developed but are still under review	National	WCS, Uganda office
Ecosystem services	All available to some extent.	Murchison-Semliki landscape, except for carbon regulating services that are being assessed at national level	PEPD/Tullow and National Forest Authority
Land use	- Protected area boundaries and their designations are available. - Land use/cover change can be generated at national scale from available layers - Other layers in this category are not available	National, where available	WCS, Uganda office
People	- Population, population pressure and infrastructure are available - A report is available to inform use of forests by communities - Data is missing for pollution and pollution risk, and impact of projects on people	National, where available	WCS, Uganda office