



#### With generous support from:

















# **TABLE OF CONTENTS**

GLOSSARY	3
EXECUTIVE SUMMARY	5
Aichi Biodiversity Target 11 Elements: Current status and opportunities for action	5
INTRODUCTION	8
SECTION I: CURRENT STATUS	10
COVERAGE	11
ECOLOGICAL REPRESENTATIVENESS	14
AREAS IMPORTANT FOR BIODIVERSITY	16
AREAS IMPORTANT FOR ECOSYSTEM SERVICES	19
CONNECTIVITY & INTEGRATION	22
GOVERNANCE DIVERSITY	23
PROTECTED AREA MANAGEMENT EFFECTIVENESS	27
SECTION II: EXISTING PROTECTED AREA AND OECM COMMITMENTS	28
PRIORITY ACTIONS FROM 2015-2016 REGIONAL WORKSHOPS	28
NATIONAL BIODIVERSITY STRATEGY AND ACTION PLANS (NBSAPs)	30
APPROVED GEF-5, GEF-6 & GCF PROTECTED AREA PROJECTS	32
OTHER ACTIONS/COMMITMENTS	33
ANNEX I	
FULL LIST OF ECOREGIONS	34
REFERENCES	35

# **GLOSSARY**

AZEs Alliance for Zero Extinction sites
CEPF Critical Ecosystem Partnership Fund

EEZ Exclusive Economic Zone
GCF Green Climate Fund

GD-PAME Global Database on Protected Area Management Effectiveness

GEF Global Environment Facility

IBA Important Bird and Biodiversity Area

ICCAs Indigenous and Community Conserved Area Area (may also be referred to as

territories and areas conserved by Indigenous peoples and local communities or

"territories of life")

IPLC Indigenous Peoples and Local Communities

KBA Key Biodiversity Area

NBSAP National Biodiversity Strategy and Action Plan
OECM Other Effective Area-Based Conservation Measures

PA Protected Area

PAME Protected Area Management Effectiveness

PPA Privately Protected Area

ProtConn Protected Connected land indicator

SOC Soil Organic Carbon

TEOW Terrestrial Ecosystems of the World WDPA World Database on Protected Areas

WD-OECM World Database on Other Effective Area-Based Conservation Measures

#### Disclaimer

The designations employed and the presentation of material in this dossier do not imply the expression of any opinion whatsoever on the part of the Secretariat of the Convention on Biological Diversity (SCBD) or United Nations Development Programme (UNDP) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The information contained in this publication do not necessarily represent those of the SCBD or UNDP.

This country dossier is compiled by the UNDP and SCBD from publicly available information. It is prepared, within the overall work of the Global Partnership on Aichi Biodiversity Target 11, for the purpose of attracting the attention of the Party concerned and other national stakeholders to facilitate the verification, correcting, and updating of country data. The statistics might differ from those reported officially by the country due to differences in methodologies and datasets used to assess protected area coverage and differences in the base maps used to measure terrestrial and marine area of a country or territory. Furthermore, the suggestions from the UNDP and SCBD are based on analyses of global datasets, which may not necessarily be representative of national policy or criteria used at the national level. The analyses are also subject to the limits inherent in global indicators (precision, reliability, underlying assumptions, etc.). Therefore, they provide useful information but cannot replace analyses at a national level nor constitute a future benchmark for national policy or decision-making.

The preparation of this dossier was generously supported by: the Government of the Federal Republic of Germany, *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GMbH*; the European Commission; the Government of the United Kingdom of Great Britain and Northern Ireland; and the Government of Japan (Japan Biodiversity Fund). The dossier does not necessarily reflect their views.

This publication may be reproduced for educational or non-commercial purposes without special permission from the copyright holders, provided acknowledgement of the source is made. The SCBD and UNDP would appreciate receiving a copy of any publications that use this document as a source.

# **EXECUTIVE SUMMARY**

This document provides information on the coverage of protected areas (PAs) and other effective area-based conservation measures (OECMs), as currently reported in global databases (the World Database on Protected Areas (WDPA) and World Database on Other Effective Area-Based Conservation Measures (WD-OECM)). It also includes details on the status of the other qualifying elements of Aichi Biodiversity Target 11 based on this data. These statistics might differ from those reported officially by countries due to difference in methodologies and datasets used to assess protected area coverage, differences in the base maps used to measure terrestrial and marine area of a country or territory, or if global datasets differ from the criteria and indicators used at the national level. Where available, data from national statistics for the elements of Target 11 are included alongside records from these global databases. This dossier also provides a summary of commitments made under Aichi Biodiversity Target 11, and a summary of potential opportunities regarding elements of the target for future planning.

The dossier has been developed in consultation with the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), which manages the WDPA, WD-OECM and Global Database on Protected Area Management Effectiveness (GD-PAME). Parties to the CBD are requested to contact protectedareas@unep-wcmc.org with any updates to the information in these databases.

# Aichi Biodiversity Target 11 Elements: Current status and opportunities for action

#### Coverage

- **Status:** as of May 2021 (per the WDPA), terrestrial coverage in Mali is 94,591.2 km<sup>2</sup> (7.5%); National reporting indicates total coverage of 9,885,459 ha (or 8%).
- Opportunities for action: opportunities for the near-term include updating the WDPA with any unreported PAs, and the recognizing and reporting OECMs to the WD-OECM. In the future, focus on relatively intact areas, while addressing the elements in the following sections, could be considered when planning new PAs or OECMs.

#### **Ecological Representativeness**

- **Status:** Mali contains 5 terrestrial ecoregions: the mean coverage by reported PAs and OECMs is 17.6%, while1 terrestrial ecoregion has no coverage.
- **Opportunities for action:** there is opportunity for Mali to increase protection in terrestrial ecoregions that have lower levels of coverage by PAs or OECMs. Ecoregions which currently have no coverage by PAs or OECMs are key areas for action.

#### **Areas Important for Biodiversity**

- **Status:** Mali has 17 Key Biodiversity Areas (KBAs): the mean protected coverage of KBAs by reported PAs and OECMs is 61.6%, while 4 KBAs have no coverage by reported PAs and OECMs.
- **Opportunities for action:** there is opportunity for Mali to increase protection of KBAs that have lower levels of coverage by PAs and OECMs; priority could be given to those with no current coverage.

#### **Areas Important for Ecosystem Services**

- **Status:** coverage of areas important for ecosystem services: In Mali, 11.2% of aboveground biomass carbon, 10.6% of belowground biomass carbon and 7.9% of soil organic carbon is covered by PAs and OECMs.
- **Opportunities for action:** for carbon, there is opportunity for Mali to increase PA and OECM coverage in terrestrial areas with high carbon stocks. Protecting areas with high carbon stocks secures the benefits of carbon sequestration in the area.
- For water, there is opportunity to increase the area of the water catchment under protection by PAs and OECMs, or in cases where there is high levels of protection, focus on effective management for these areas. Protecting the current area of forested land and potentially reforesting would have benefits for improving water security.

#### Connectivity and Integration

- **Status:** coverage of protected-connected lands is 4.6%.
- **Opportunities for action:** there is opportunity for a general increase of PAs or OECMs and to focus on PA and OECM management for enhancing and maintaining connectivity. Improving connectivity increases the effectiveness of PAs and OECMs and reduces the impacts of fragmentation.
- As well, a range of suggested steps for enhancing and supporting integration are included in the voluntary guidance on the integration of PAs and OECMs into the wider land- and seascapes and mainstreaming across sectors to contribute, inter alia, to the SDGs (Annex I of COP Decision 14/8).

#### **Governance Diversity**

- **Status:** the most common governance type(s) for reported PAs in Mali is: 95.6% under Government (83.8% Federal or national ministry or agency; 11.8% Government delegated management).
- **Opportunities for action:** explore opportunities for governance types that have lower representation, for Mali this could relate to governance by Indigenous Peoples and/or local communities (IPLC), shared governance, etc.
- There is also opportunity for Mali to complete governance and equity assessments, to establish baselines and identify relevant actions for improvement. As well, a

range of suggested actions are included in the voluntary guidance on effective governance models for management of protected areas, including equity (Annex II of COP Decision 14/8).

#### Protected Area Management Effectiveness

- **Status:** 83.8% of terrestrial PAs have completed Protected Area Management Effectiveness (PAME) assessments reported.
- **Opportunities for action:** the 60% target for completed management effectiveness assessments (per COP Decision X/31) **has** been met for terrestrial PAs. Further increasing this percentage could be beneficial overall for understanding how well protected areas are being managed.
- There is also opportunity to implement the results of completed PAME evaluations, to improve the quality of management for existing PAs and OECMs (e.g. through adaptive management and information sharing, increasing the number of sites reporting 'sound management') and to increase reporting of biodiversity outcomes in PAs and OECMs.

# **INTRODUCTION**

The Strategic Plan for Biodiversity 2011-2020 was adopted at the tenth meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) held in Nagoya, Aichi Prefecture, Japan from 18-29 October 2010. The vision of the Strategic Plan is one of "Living in harmony with nature" where "By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people" (CBD, 2010). In addition to this vision, the Strategic Plan is composed of 20 targets, under five strategic goals. Aichi Biodiversity Target 11 states that "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."

With the conclusion of the Aichi Biodiversity Targets in 2020, Target 11 on area-based conservation has seen success in the expansion of the global network of protected areas (PA) and other effective area-based conservation measures (OECMs). The negotiation of the post-2020 Global Biodiversity Framework (GBF) and its future targets provide an essential opportunity to further improve the coverage of PAs and OECMs, to improve other aspects of area-based conservation, to accelerate progress on biodiversity conservation more broadly, while also addressing climate change, and the Sustainable Development Goals. This next set of global biodiversity targets are to be adopted at the fifteenth meeting of the Conference of the Parties to the Convention on Biological Diversity. These new targets must aim to build upon lessons learned from the last decade of progress to deliver transformative change for the benefit of nature and people, to realize the 2050 Vision for biodiversity.

The United Nations Development Programme (UNDP) and the Secretariat of the Convention on Biological Diversity have developed the Aichi Biodiversity Target 11 Country Dossiers, which provide countries with an overview of the status of Target 11 elements, opportunities for action, and a summary of commitments made by Parties over the last decade. Each dossier can support countries in assessing their progress on key elements of Aichi Biodiversity Target 11 and identifying opportunities to prioritize new protected areas and OECMs.

This dossier provides an overview of area-based conservation in Mali. Section I of the dossier presents data on the current status of Mali's PAs and OECMs. The data presented in Section I relates to each element of Target 11. Section I also presents the PA and OECM coverage for two critical ecosystem services: water security and carbon stocks. In addition, the dossier presents potential opportunities for action for Mali, in relation to each Target 11 element. The analyses present options for improving Mali's area-based conservation network to achieve enhanced protection and benefits for livelihoods and climate change. Section II presents details on Mali's existing PA and OECM commitments as a summary of existing efforts towards achieving Target 11. This gives focus not only to national policy and actions but also voluntary commitments to the UN. Furthermore, where data is

available, this dossier provides information on potential OECMs, Indigenous and Community Conserved Areas (ICCAs; also, often referred to as territories and areas conserved by Indigenous peoples and local communities or "territories of life") and Privately Protected Areas (PPAs) and the potential contribution they will have in achieving the post-2020 targets.

The information on PAs and OECMs presented here is derived from the World Database on Protected Areas (WDPA) and World Database on Other Effective Area-Based Conservation Measures (WD-OECM). These databases are joint products of UNEP and IUCN, managed by UNEP-WCMC, and can be viewed and downloaded at www.protectedplanet.net. Parties are encouraged to provide data on their PAs and OECMs to UNEP-WCMC for incorporation into the databases (see e.g., Decisions 10/31 and 14/8). The significant efforts of Parties in updating their data in the build up to the publication of the Protected Planet Report 2020 (UNEP-WCMC and IUCN, 2021) were greatly appreciated. UNEP-WCMC welcomes further updates, following the data standards described here (www.wcmc.io/WDPA\_Manual), and these should be directed to protectedareas@unep-wcmc.org. The statistics presented in this dossier are derived from the May 2021 WDPA and WD-OECM releases, unless explicitly stated otherwise. Readers should consult www.protectedplanet.net for the latest coverage statistics (updated monthly).

Some data from the WDPA and WD-OECM are not made publicly available at the request of the data-provider. This affects some statistics, maps, and figures presented in this dossier. Statistics provided by UNEP-WCMC (terrestrial and marine coverage) are based upon the full dataset, including restricted data. All other statistics, maps, and figures are based upon the subset of the data that is publicly available.

Where data is less readily available, such as for potential OECMs, ICCAs and PPAs, data has also been compiled from published reports and scientific literature to provide greater awareness of these less commonly recorded aspects. These data are provided to highlight the need for comprehensive reporting on these areas to the WDPA and/or WD-OECM. Parties are invited to work with indigenous peoples, local communities and private actors to submit data under the governance of these actors, with their consent, to the WDPA and/or WD-OECM.

Overall, PAs and OECMs are essential instruments for biodiversity conservation and to sustain essential ecosystem services that support human well-being and sustainable development, including food, medicine, and water security, as well as climate change mitigation and adaptation and disaster risk reduction. The data in this dossier, therefore, aims to celebrate the current contributions of PAs and OECMs, whilst the gaps presented hope to encourage greater progress, not just for the benefit of biodiversity and the post-2020 GBF, but also to recognize the essential role of PAs and OECMs to the Sustainable Development Goals and for addressing the climate crisis.

# **SECTION I: CURRENT STATUS**

Aichi Biodiversity Target 11 refers to both protected areas (PAs) and other effective areabased conservation measures (OECMs). This section provides the current status for all elements of Aichi Biodiversity Target 11 where indicators with global data are available. Statistics for all elements are presented using data on both PAs and OECMs (where this data is available and reported in global databases like the WDPA and WD-OECM). It is recognized that statistics reported in the WPDA and WD-OECM might differ from those reported officially by countries due to differences in methodologies and datasets used to assess protected area coverage and differences in the base maps used to measure terrestrial and marine area of a country or territory. Details on UNEP-WCMC's methods for calculating PA and OECM coverage area available here. The global indicators adopted here for presenting the status of other elements of Target 11 may also differ from those in use nationally. Where available, results from national reporting are also included.

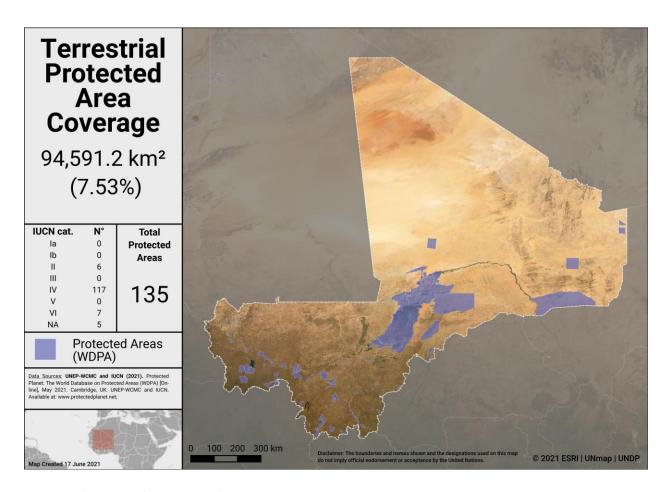
#### **COVERAGE**

As of May 2021, Mali has 136 protected areas reported in the World Database on Protected Areas (WDPA). 0 are proposed or not reported, 0 PAs have no spatial boundary and no area listed in the WDPA, and a further 1 UNESCO-MAB Biosphere Reserves are not included in the following statistics.

As of May 2021, Mali has 0 OECMs reported in the world database on OECMs (WD-OECM). Current coverage for Mali (per the WDPA):

• 7.5% terrestrial (135 protected areas, 94,591.2 km<sup>2</sup>)

National reporting indicates total coverage of 9,885,459 ha (or 8%). This may impact some elements in the following sections.



Terrestrial Protected Areas in Mali

#### **Potential OECMs**

#### Mali notes that:

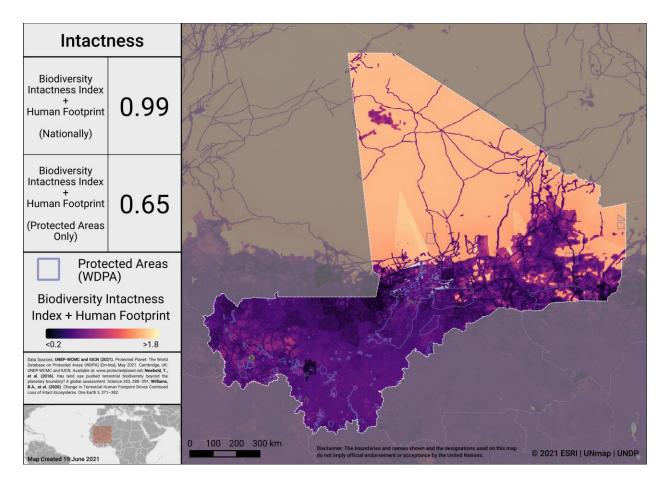
The insufficiency of human resources (in quantity and quality) and of financial resources or infrastructures is an important blocking element in optimizing the management of parks.

- The weak capacities of the actors (field agents, populations, local communities) and the lack of access to appropriate training does not change this situation
- The lack of adequate management tools for certain parks (development plans, management plans management, business plan) is obviously underlined as penalizing
- The difficulty of implementing development and management plans when they exist for internal reasons (see above the capacity of managers) or external: for example, human occupation in parks, the illiteracy of populations and the perception of these last... are often incompatible with conservation objectives;
- Weak partnerships with donors (not enough external funding, little sustainability)
   limits the possibilities of improving the management system
- The incivism of citizens and the weakness in the application of the law by the competent authorities are obviously also penalizing
- The overall degradation of the environment due to climate change, pressure human poverty and population poverty is of concern, and should be studied in detail the impact on protected areas
- Finally, there is a real problem of information and communication on protected areas.

The very existence of protected areas (of different categories) is recognized as a fundamental achievement; it is underlined that Mali still has potentially interesting areas for the conservation of biodiversity, which could be classified. The development of a development and management plan (PAG) as a fundamental basis for the sustainable use and management of protected areas, will be a positive element in terms of management when it is applied everywhere, which does not is not yet the case.

#### Opportunities for action

Opportunities for the near-term include updating the WDPA with any unreported PAs, and the recognizing and reporting OECMs to the WD-OECM. In the future, as Mali considers where to add new PAs and OECMs, the map below identifies areas in Mali where intact areas are not currently protected. Focus on relatively intact areas, while addressing the elements in the following sections, could be considered when planning new PAs or OECMs.



Intactness in Mali

To explore more on intactness visit the UN Biodiversity Lab: map.unbiodiversitylab.org.

#### **ECOLOGICAL REPRESENTATIVENESS**

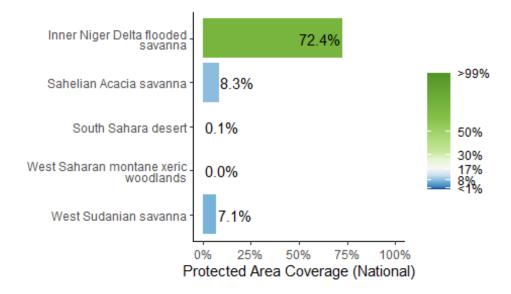
Ecological representativeness, globally, is assessed based on the PAs and OECMs coverage of broad-scale biogeographic units. Globally, ecoregions have been described for terrestrial areas (Dinerstein et al, 2017), marine coastal and shelf ecosystems (to a depth of 200m; Spalding et al 2007) and surface pelagic waters (Spalding et al 2012).

Nationally, Mali is divided into four bioclimatic zones which are distributed from north to south, in the Saharan zone (desert and covering 51% of the territory), Sahelian (arid to semi-arid, on 23% of the territory), Sudanese (17.5% of the territory) and Guinean (6% of the territory), to which should be added the interior Niger delta straddling the Sudanese and Sahelian zones (see further details in Mali's Sixth National Report).

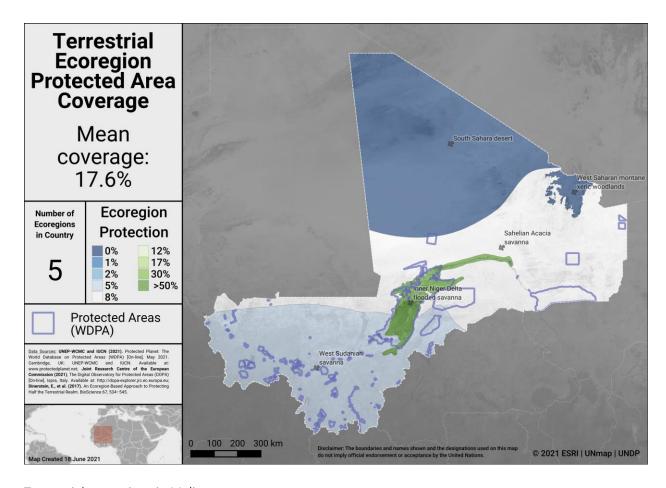
#### Mali has 5 **terrestrial** ecoregions. Out of these:

- 4 ecoregions have at least some coverage from PAs and OECMs.
- 1 ecoregion has at least 17% protected within the country.
- The average coverage of ecoregions is 17.6%.

A full list of ecoregions in Mali is available in Annex I.



Terrestrial ecoregions of the World (TEOW) in Mali



Terrestrial ecoregions in Mali

#### Opportunities for action

There is opportunity for Mali to increase protection in terrestrial ecoregions that have lower levels of coverage by PAs or OECMs. Ecoregions which currently have no coverage by PAs or OECMs are key areas for action.

#### AREAS IMPORTANT FOR BIODIVERSITY

#### **Key Biodiversity Areas (KBAs)**

Protected area and OECM coverage of Key Biodiversity Areas (KBAs) provide one proxy for assessing the conservation of areas important for biodiversity at national, regional and global scales. KBAs are sites that make significant contributions to the global persistence of biodiversity (IUCN, 2016). The KBA concept builds on four decades of efforts to identify important sites for biodiversity, including Important Bird and Biodiversity Areas, Alliance for Zero Extinction sites, and KBAs identified through Hotspot ecosystem profiles supported by the Critical Ecosystem Partnership Fund. Incorporating these sites, the dataset of internationally significant KBAs includes Global KBAs (sites shown to meet one or more of 11 criteria in the Global Standard for the Identification of KBAs, clustered into five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and irreplaceability), Regional KBAs (sites identified using pre-existing criteria and thresholds, that do not meet the Global KBA criteria based on existing information), and KBAs whose Global/Regional status is Not yet determined, but which will be assessed against the global KBA criteria within 8-12 years. Regional KBAs are often of critical international policy relevance (e.g., in EU legislation and under the Ramsar Convention on Wetlands), and many are likely to qualify as Global KBAs in future once assessed for their biodiversity importance for other taxonomic groups and ecosystems. To date, nearly 16,000 KBAs have identified globally, and information on each of these is presented in the World Database of Key Biodiversity Areas: www.keybiodiversityareas.org.

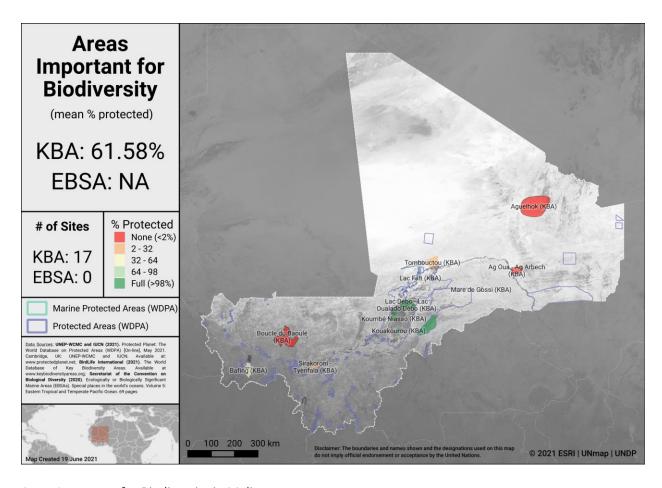
Mali has 17 Key Biodiversity Areas (KBAs).

- Mean percent coverage of all KBAs by PAs and OECMs in Mali is **61.6%**.
- **9** KBAs have full (>98%) coverage by PAs and OECMs.
- 4 KBAs have partial coverage by PAs and OECMs.
- **4** KBAs have no (<2%) coverage by PAs and OECMs.

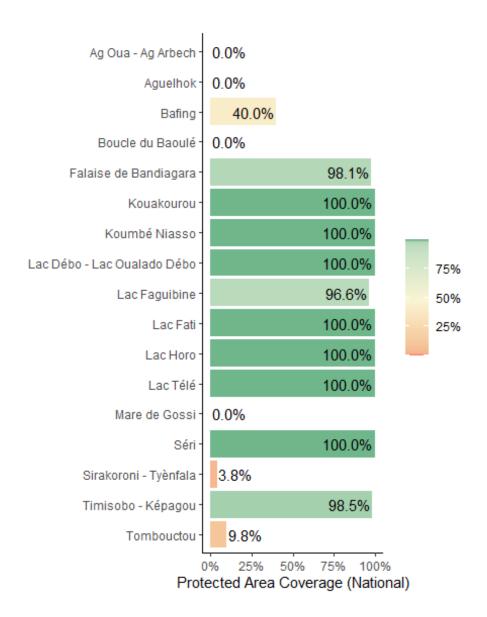
#### Other important areas for biodiversity:

- 4 Ramsar sites (DIN, Sourou, Wegnia and Magui)
- Partial Reserve for the Elephants of Gourma
- Baoulé Loop Biosphere Reserve (RBBB) includes the Badinko, Fina Reserve blocks
- Kongossambougou
- The National Parks of Wongo, Kouroufing and the Zimpanzee Sanctuaries
- The Bougouni Yanfolila complexes (Niénendougou, Djangoumerila, Djinetoumanina)
- Several hunting ZICs (hunting interest zones) in northern Mali.

See further details in DNEF 2020 annual report and Mali's WDPA country profile.



Areas Important for Biodiversity in Mali



Key Biodiversity Area Coverage (KBA) in Mali

#### Opportunities for action

There is opportunity for Mali to increase protection of KBAs that have lower levels of coverage by PAs and OECMs; priority could be given to those with no current coverage.

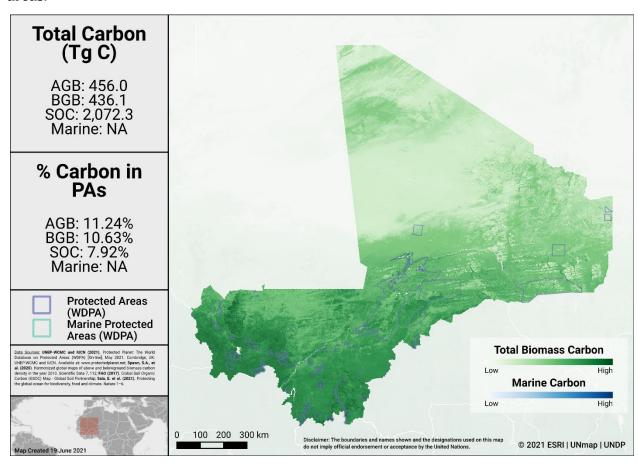
#### AREAS IMPORTANT FOR ECOSYSTEM SERVICES

There is no single indicator identified for assessing the conservation of areas important for ecosystem services. For simplicity, two services with available global datasets are assessed here (carbon and water). In future, other critical ecosystem services could be explored.

#### Carbon

Data for biomass carbon comes from temporally consistent and harmonized global maps of aboveground biomass and belowground biomass carbon density (at a 300-m spatial resolution); the maps integrate land-cover specific, remotely sensed data, and land-cover specific empirical models (see Spawn et al., 2020 for details on methodology). The Global Soil Organic Carbon Map present an estimation of SOC stock from 0 to 30 cm (see FAO, 2017). Data is also presented from global maps of marine sedimentary carbon stocks, standardized to a 1-meter depth (see Sala et al., 2021, and Atwood et al., 2020).

The map below presents the total carbon stocks in Mali and the percent of carbon in protected areas. The total carbon stocks is 456.0 Tg C from aboveground biomass (AGB), with 11.2% in protected areas; 436.1 Tg C from below ground biomass (BGB), with 10.6% in protected areas and 2,072.3 Tg C from soil organic carbon (SOC), with 7.9% in protected areas.



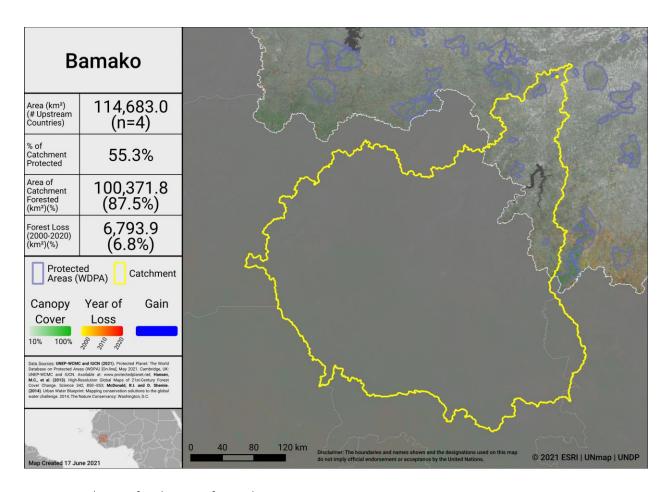
Carbon Stocks in Mali

#### Water

Information on the water sources for 534 cities is available via the City Water Map (CWM) and provides details on the catchment area of the watershed that supplies these cities (see McDonald et al., 2014 for details on methodology).

Forests and intact ecosystems support stormwater management and clean water availability, especially for large urban populations. Research that has examined the role of forests for city drinking water supplies shows that of the world's 105 largest cities, more than 30% (33 cities) rely heavily on the local protected forests, which provide ecosystem services that underpin local drinking water availability and quality (Dudley & Stolton, 2003).

Drinking water supplies for cities in Mali may similarly depend on protected forest areas within and around water catchments. The map below shows the percentage forest and PA cover and the forest loss from 2000-2020 in the most heavily populated water catchment of Mali. Intact catchments can support more consistent water supply and improved water quality.



Water supply area for the city of Bamako

#### Opportunities for action

For carbon, there is opportunity for Mali to increase PA and OECM coverage in terrestrial areas with high carbon stocks, as identified in the map above. Protecting areas with high carbon stocks secures the benefits of carbon sequestration in the area.

For water, there is opportunity to increase the area of the water catchment under protection by PAs and OECMs, or in cases where there is high levels of protection, focus on effective management for these areas (for the city of Bamako, transboundary coordination may be needed). Protecting the current area of forested land and potentially reforesting would have benefits for improving water security.

#### **CONNECTIVITY & INTEGRATION**

Two global indicators, the Protected Connected land indicator (ProtConn; EC-JRC, 2021; Saura et al., 2018) and the PARC-Connectedness indicator (CSIRO, 2019), have been proposed for assessing the terrestrial connectivity of PA and OECM networks (to date there is no global indicator for assessing marine connectivity).

#### Protected Connected Land Indicator (Prot-Conn)

As of January 2021, as reported in the Joint Research Centre of the European Commission's Digital Observatory for Protected Areas (DOPA) (JRC, 2021), the coverage of protected-connected lands (a measure of the connectivity of terrestrial protected area networks, assessed using the ProtConn indicator) in Mali was 4.6%.

#### **PARC-Connectedness Index**

In 2019, as assessed using the PARC-Connectedness Index (values ranging from 0-1, indicating low to high connectivity), connectivity in Mali is 0.45. This represents no significant change since in 2010.

#### Corridor case studies

Mali has been able to draw up a development plan in relation to the Partial Reserve of Elephants of Gourma between Mali and the Sahel Burkina which constitutes a good example of elephant migration corridors between the two countries.

It is also the ZIC ("hunting interest zone) of Nema Woula and Mandé Woula in southern Mali, which has been the subject of a development and management plan. This zone also constitutes a corridor between Mali and Guinea.

It is the same for the Wongo and Kouroufing Park which constitutes a corridor between this south-north part and the Niokolokoba Park of Senegal (formerly was the migration route for large fauna but today obstructed by human occupations).

#### Opportunities for action

There is opportunity for a general increase of PAs or OECMs and to focus on PA and OECM management for enhancing and maintaining connectivity. Improving connectivity increases the effectiveness of PAs and OECMs and reduces the impacts of fragmentation.

As well, a range of suggested steps for enhancing and supporting integration are included in the voluntary guidance on the integration of PAs and OECMs into the wider land- and seascapes and mainstreaming across sectors to contribute, inter alia, to the SDGs (Annex I of COP Decision 14/8).

#### **GOVERNANCE DIVERSITY**

There is a lack of comprehensive global data on governance quality and equity in PAs and OECMs. Here, we provide data on the diversity of governance types for reported PAs and OECMs.

The stakeholders in PA management in Mali is dominated by the National Administration through the National Management Directorates. It is noted that there is a weak involvement of the private sector, communities and Private partners, but there is mixed management of PAs and weak funding in this sector, for which the State has other priorities such as health, education, security, etc.

As of May 2021, PAs in Mali reported in the WDPA have the following governance types:

- 95.6% are governed by **governments** 
  - 83.8% by federal or national ministry or agency
  - 0.0% by sub-national ministry or agency
  - 11.8% by government-delegated management
- 4.4% are under **shared** governance (by collaborative governance)
- 0.0% are under **private** governance
- 0.0% are under IPLC governance
  - 0.0% by Indigenous Peoples
  - 0.0% by local communities
- 0.0% **do not** report a governance type

#### **OECMs**

As of May 2021, there are **0** OECMs in Mali reported in the WD-OECM, therefore there is no data available on OECM governance types.

#### Privately Protected Areas (PPAs)

There is currently no data available on PPAs for Mali (see Gloss et al., 2019, and Stolton et al., 2014 for details).

Territories and areas conserved by Indigenous Peoples and local communities (ICCAs)

There is currently no data available on ICCAs for Mali (see Kothari et al., 2012 and the ICCA Registry for further details).

#### Other Indigenous lands

Lands managed and/or controlled by Indigenous Peoples cover an area of 929,628.0 km<sup>2</sup>, of which 826,006.0 km<sup>2</sup> falls outside of formal protected areas. Indigenous lands with a human footprint less than 4 (considered as 'natural landscapes') cover an area of 466,022.0 km<sup>2</sup> (for details on analysis see Garnett et al., 2018).

For Mali, evidence for the presence of Indigenous Peoples comes from: Indigenous Work Group on Indigenous Affairs. Indigenous World 2017 (Indigenous Working Group on Indigenous Affairs, 2017).

Boundaries of the lands Indigenous Peoples manage or have tenure rights over come from: Harrison, A. Fulfulde Language Family Report (SIL International, 2003); Dersso, S. Egypt: Constitutional, legislative and administrative provisions concerning Indigenous Peoples (International Labour Organization, 2009).

#### Opportunities for action

Explore opportunities for governance types that have lower representation, for Mali this could relate to governance by Indigenous Peoples and/or local communities (IPLC), shared governance.

There is also opportunity for Mali to complete governance and equity assessments, to establish baselines and identify relevant actions for improvement. Examples of existing tools and methodologies include: Governance Assessment for Protected and Conserved Areas (Franks & Brooker, 2018), Social Assessment of Protected Areas (Franks et al 2018), and Site-level assessment of governance and equity (IIED, 2020). As well, a range of suggested actions are included in the voluntary guidance on effective governance models for management of protected areas, including equity (Annex II of COP Decision 14/8).

#### **Equator Prize Projects**

The Equator Initiative brings together the United Nations, governments, civil society, businesses and grassroots organizations to recognize and advance local sustainable development solutions for people, nature and resilient communities.

The Equator Prize projects provide examples of unique and locally based governance of natural resources. Mali has the following Equator Prize winners that showcase examples of local, sustainable community action:

Organization	Year	Project Description
Pôle des Actions d'Intégration des Droits Humains en Afrique (PACINDHA, African Centre for the Integration of Human Rights)	2006	This NGO mobilizes local communities in western and southwestern Mali to sustainably manage natural resources and protect biodiversity. Since 2003, the initiative has implemented a wide range of activities, including the protection of wildlife and fauna species, combating the use of polluting substances, and improving land management and access to water for local communities.  One key intervention has been to restore the Detarium Microcarpum plant population, a species which had become endangered because of overuse and bush fires. The promotion and commercialization of products such as jewelry made from the plant, the popularization of its medicinal properties, and wider activities to support the sustainable harvest of the species have created income for the community: the group has successfully rejuvenated 200 ha of Detarium Microcarpum in ten villages throughout Ouelessebougou.
The Mali Elephant Project	2017	In a drought-prone zone rife with resource conflicts and violent extremism, the Mali Elephant Project brings together various ethnic groups to effectively manage local resources and protect an internationally important population of 350 endangered African elephants. Through the formation of community-based natural resource management committees, the provision of additional income through support for women's groups engaged in sustainable harvest of non-timber forest products, and anti-poaching measures involving 'eco-guardian' youth community members, the initiative has reduced poaching of elephants in the 32,000 km² area, improved social cohesion between different local communities, and contributed to peace-building efforts by providing alternatives to joining extremist groups. Communities have created rules for local use of natural resources, set aside forests for elephant use, formed pasture reserves, and designated seasonal water sources to be shared by people,

livestock, and elephants.



#### PROTECTED AREA MANAGEMENT EFFECTIVENESS

This section provides information on the coverage of PAs and OECMs with completed protected area management effectiveness (PAME) assessments as reported in the global database (GD-PAME). The proportion of terrestrial and marine PAs with completed PAME assessments is also calculated and compared with the 60% target agreed to in COP-10 Decision X/31. Information is also included regarding changes in forest cover nationally within PAs and OECMs.

#### Protected area management effectiveness (PAME) assessments

As of May 2021, Mali has 136 PAs reported in the WDPA; of these PAs, 13 (9.6%) have management effectiveness evaluations reported in the global database on protected area management effectiveness (GD-PAME).

- 6.3% (792.2 km²) of the terrestrial area of the country is covered by PAs with completed management effectiveness evaluations.
  - 83.8% of the area of terrestrial PAs have completed evaluations.

The 60% target for completed management effectiveness assessments (per COP Decision X/31) **has** been met for terrestrial PAs.

Mali has benefited with the support of the IUCN from the vast PA management assessment programs which covered 11 protected areas in 2008: 1. Boucle du Baoulé Biosphere Reserve (533,037 ha); 2. Areas adjacent to the Boucle du Baoulé Biosphere Reserve; 3. The Mali-Guinea cross-border area of Bafing Famélé (332,639 ha, under development creation); 4. Special elephant reserve of Douentza (Gourma) (1,250,000 ha); 5. Sousan and Banifing Baoulé; 6. Nienendougou Wildlife Reserve and ZIC (40,640 ha); 7. The Tamesna Wildlife Reserve and the Adrar des Iforas (600,000 ha, ongoing Creation); 8. The Ansongo - Ménaka Giraffes Special Reserve (1,750,000 ha); 9. The Tidermène - Alata area of hunting interest (312,000 ha), area leased; 10. Other reserve and areas of hunting interest (not studied within the framework of this evaluation); 11. Inner Niger Delta (RAMSAR website.

As of May 2021, there are 0 OECMs in Mali reported in the WD-0ECM and no information available on the management effectiveness of potential OECMs.

#### Opportunities for action

The 60% target for completed management effectiveness assessments (per COP Decision X/31) **has** been met for terrestrial PAs, therefore. Further increasing this percentage would be beneficial overall for understanding how well protected areas are being managed.

There is also opportunity to implement the results of completed PAME evaluations, to improve the quality of management for existing PAs and OECMs (e.g. through adaptive management and information sharing, increasing the number of sites reporting 'sound management') and to increase reporting of biodiversity outcomes in PAs and OECMs.

# SECTION II: EXISTING PROTECTED AREA AND OECM COMMITMENTS

#### PRIORITY ACTIONS FROM 2015-2016 REGIONAL WORKSHOPS

National priority actions for Aichi Biodiversity Target 11 were provided by Parties following a series of regional workshops in 2015 and 2016. The Capacity-building workshop for Africa on achieving Aichi Biodiversity Targets 11 and 12 took place 21 - 24 March 2016 in Entebbe, Uganda. Progress towards the quantitative targets for marine and terrestrial coverage has been assessed based on data reported in the WDPA and WD-OECM as of 2021. For more information, see the workshop report at: https://www.cbd.int/meetings/

The following actions were identified during the workshops:

#### **Terrestrial coverage:**

- 1) Conduct a gap analysis in relation to the connectivity of protected areas and their ecological representation (inventory to see habitats, resource status, etc.); we must also make the identification of sites (2016 2020)
- 2) Develop a management plan and management of new protected areas. (2016 2020).

#### **Ecological representation:**

- 1) Evaluation of governance around PAs (2017-2020).
- 2) Develop a strategy to improve governance through the establishment of an institutional framework (office-type structure of protected areas including the private sector and local authorities (2017-2020).

**Areas Important for biodiversity and ecosystem services:** Creation of transboundary protected areas with seven neighboring countries of Mali (2016-2020).

#### **Connectivity:**

- 1) Establishment of a network of protected areas (2016-2020)
- 2) Creation of the corridors in and around protected areas (2017-2020).

#### **Management effectiveness:**

- 1) Evaluation of the economic and social value of PAs (2017-2020).
- 2) Establishment of micro-credit funds for the implementation of income generating activities / AGR (2016-2020).

**Governance and Equity:** Support - advice and awareness of local communities of protected areas for the promotion of sustainable agriculture in the peripheral areas of PAs (2016 - 2020).

**Integration into the wider landscape:** No actions were identified for this element of Target 11.

#### **OECMs:**

- 1) Government commitment to the development and promotion of a policy of encouraging ecotourism through the creation of infrastructure and the development of tourist sites (2016-2020).
- 2) Creation of the Office of Protected Areas (2016-2020).

#### NATIONAL BIODIVERSITY STRATEGY AND ACTION PLANS (NBSAPs)

Mali has submitted an NBSAP during the Strategic Plan for Biodiversity 2011-2020 (most recent NBSAP is available at: https://www.cbd.int/nbsap/search/).

This NBSAP did include a quantitative target for terrestrial PAs or OECMs.

Target 10: By 2018, at least 15% of the total area of the country, including those areas that are particularly important for biodiversity, are conserved through an ecologically representative and well-connected network of protected areas effectively managed.

- As of May 2021 (based on the WDPA/WD-OECM) has the target been met: NO
- Accounting for other projects, actions and commitments, if this target is met, coverage in the country will increase by  $\sim 90,000 \text{ km}^2$ .

Actions from the NBSAP will also address other elements of Aichi Biodiversity Target 11:

NBSAP Action number	Action (original language from NBSAP)	Action (English translation)
17	17. Promulguer le projet de loi sur les mesures incitatives relatives aux aires protégées	Enact the bill on incentives related to protected areas
25	25. Elaborer des plans de gestion et d'aménagement de toutes les aires protégées qui n'en sont pas pourvus	Develop plans for management and development of all protected areas
46	46. Doter toutes les forêts classées de statut d'aire protégée	Give all classified forests protected area status
47	47. Matérialiser les limites et sécuriser des Aires Protégées	Materialize and secure boundaries of Protected Areas
49	49. Créer de nouvelles Aires Protégées	Creating new protected areas
50	50. Étendre la réserve spéciale de Douentza à tous le circuit de migration actuel des éléphants.	Extend Douentza special reserve to the entire current elephant migration circuit.

NBSAP Action number	Action (original language from NBSAP)	Action (English translation)
51	51. Elaborer et mettre en oeuvre les plans d'aménagement de forêts classées (Kangaba, Guinina, Bossofala, Néguéla, Tienfala, Didiéni, Kénenkoun et Nyamina) ; des 8 forêts classées du Cercle de Youwarou ; les massifs de Ségué et de Samori dans le Séno ; de «Grigualé» (Koulikoro)	Develop and implement management plans for classified forest reserves (Kangaba Guinina, Bossofala, Néguéla, Tienfala, Didiéni, Kénenkoun and Nyamina); 8 classified forests of the Youwarou Circle; and the forests of Segue and Samori in the Seno; and "Grigualé" (Koulikoro)
55	55. Créer une réserve d'hippopotame et de Lamantin à Kayo (Koulikoro)	Create a reserve a hippopotamus and manatee reserve in Kayo (Koulikoro)
89	89. Développer des plans d'affaires pour certaines aires protégées (Gourma, complexe Bougouni – Yanfolila, Bafing- Falémé, etc.)	Develop business plans for some protected areas (Gourma, Bougouni complex - Yanfolila, Bafing-Falémé, etc.)
91	91. Développer, le partenariat public – privé, la coopération bilatérale et multilatérale pour la conservation des aires protégées.	Develop public - private partnership, bilateral and multilateral cooperation for the conservation of protected areas.

#### APPROVED GEF-5, GEF-6 & GCF PROTECTED AREA PROJECTS

#### Approved GEF-5 and GEF-6 PA-related biodiversity projects

This includes biodiversity projects from the fifth and sixth replenishment of the Global Environment Facility (GEF-5 and GEF-6) with a clear impact of the quantity or quality of PAs; also including some projects occurring within the wider landscapes/seascapes around PAs. Only those with a status of 'project approved' or 'concept approved' as of June 2019 were considered. The qualifying elements likely benefiting from each GEF project is assessed based on a keyword search of Project Identification Forms (PIF). Where spatial data for the proposed PAs was available, further details (based on an analysis by UNDP) regarding their impacts for ecological representation, coverage of KBAs, and coverage of areas important for carbon storage is included.

GEF ID	PA increase?	Area to be added (km²)	Type of new protected area	Qualitative elements potentially benefitting (based on keyword search of PIFs)
5270	No	N/A	N/A	Ecosystem services; Effectively managed; Equitably managed; Integration

Mali notes that: the support of partners is a necessity for developing countries which have only less than 1% of the budget dedicated to the Department of the Environment and the management of forest and wildlife resources.

#### Green Climate Fund PA-related projects

Mali notes that: The big obstacle in PA management is the weak contribution of the State in management, biodiversity projects linked to PAs submitted to Green Climate Funds will help fill this funding gap.

## OTHER ACTIONS/COMMITMENTS

Mali's National Determined Contributions which devotes an important part to the management of Protected Areas (source: revised CDN 2021 available)

#### Commitments for PAs and OECMs from Other National Policies

Policy document	Ecosystem	Policy text
Nationally Determined Contribution	Forest ecosystems	Development of renewable energies and energy efficiency
Nationally Determined Contribution	Forest ecosystems	Avoided forest conversion: 0.04 Mt CO2e/yr
Nationally Determined Contribution	Forest ecosystems	Reduce deforestation
Nationally Determined Contribution	Grasslands & Agricultural systems	Purification of wastewater and its reuse for irrigation needs
Strategic Investment Framework for Sustainable Land Management	Forest ecosystems	Conservation and protection of resources, medicinal (plants, animals, rocks etc)
National Biodiversity Strategy Action Plan	Grasslands & Agricultural systems	Fight bushfires
National Biodiversity Strategy Action Plan	Grasslands & Agricultural systems	Protect areas degraded by fertilizers, chemicals and pesticide
Nationally Determined Contribution	Wetland ecosystems	Avoided peat impacts: 0.03 Mt CO2e/yr
Strategic Investment Framework for Sustainable Land Management	Forest ecosystems	Protection of forests against bush wildfire
National Biodiversity Strategy Action Plan	Forest ecosystems	Identify and popularize actions likely to minimize impact the use of firewood on forest resources: improved stoves, other energy resources like cookers (electric, solar or gas), rational methods of carbonization

# **ANNEX I**

# FULL LIST OF ECOREGIONS

Ecoregion Name	Area (km²)	% of Global Ecoregion in Country	% of Country in Ecoregion	Area Protected (km²)	% Protected in Country
Inner Niger Delta flooded savanna	45,868.1	100.0	3.7	33,213.1	72.4
Sahelian Acacia savanna	435,801.4	11.9	34.7	35,988.1	8.3
South Sahara desert	410,700.7	14.1	32.7	472.4	0.1
West Saharan montane xeric woodlands	17,996.2	7.0	1.4	0.0	0.0
West Sudanian savanna	344,376.3	21.1	27.4	24,327.5	7.1

# **REFERENCES**

Atwood, TB, Witt, A, Mayorga, J, Hammill, E, & Sala, E. (2020). Global patterns in marine sediment carbon stocks. *Frontiers in Marine Science*.

https://doi.org/10.3389/fmars.2020.00165

BirdLife International (2021). World Database of Key Biodiversity Areas. Available at: http://www.keybiodiversityareas.org

CBD (2010). Decision adopted by the Conference of the Parties to the Convention on Biological Diversity at its tenth meeting. Decision X/2. Strategic plan for biodiversity 2011–2020. Retrieved from https://www.cbd.int/doc/decisions/cop-10/cop-10-dec02-en.pdf.

CSIRO (2019). Protected area connectedness index (PARCconnectedness). https://www.bipindicators.net/indicators/protected-area-connectedness-index-parcconnectedness

Dinerstein, E., et al. (2017). An ecoregion-based approach to protecting half the terrestrial realm. BioScience 67(6), 534-545.

Donald et al., 2019, The prevalence, characteristics and effectiveness of Aichi Target 11's "other effective area-based conservation measures" (OECMs) in Key Biodiversity Areas. Conservation Letters, 12(5).

EC-JRC (2021). DOPA Indicator factsheets: http://dopa.jrc.ec.europa.eu/en/factsheets

FAO (2017). Global Soil Organic Carbon (GSOC) Map - Global Soil Partnership [WWW Document]. URL http://www.fao.org/global-soil-partnership/pillars-action/4-information-and-data/global-soil-organic-carbon-gsoc-map/en/.

Franks, P and Booker, F (2018). Governance Assessment for Protected and Conserved Areas (GAPA): Early experience of a multi-stakeholder methodology for enhancing equity and effectiveness. IIED Working Paper, IIED, London. https://pubs.iied.org/17632IIED

Franks, P. et al. (2018). Social Assessment for Protected and Conserved Areas (SAPA). Methodology manual for SAPA facilitators. Second edition. IIED, London. https://pubs.iied.org/14659iied

Garnett et al. (2018). A spatial overview of the global importance of Indigenous lands for conservation. Nature Sustainability, 1(7), 369.

Global Environment Facility (GEF-5 and GEF-6); all projects can be found online at: https://www.thegef.org/projects

Gloss, L. et al. (2019). International Outlook for Privately Protected Areas: Summary Report. International Land Conservation Network (a project of the Lincoln Institute of Land Policy) and United Nations Development Programme. Summary report, and individual country profiles, available at: https://nbsapforum.net/knowledge-base/resource/international-outlook-privately-protected-areas-summary-report

Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., Tyukavina, A., Thau, D., Stehman, S.V., Goetz, S.J., Loveland, T.R., Kommareddy, A., Egorov, A., Chini, L., Justice, C.O., Townshend, J.R.G., (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. Science 342, 850–853. https://doi.org/10.1126/science.1244693

Hilty, J et al. (2020). Guidelines for conserving connectivity through ecological networks and corridors. Best Practice Protected Area Guidelines Series No. 30. Gland, Switzerland: IUCN. https://portals.iucn.org/library/sites/library/files/documents/PAG-030-En.pdf

IIED 2020. Site-level assessment of governance and equity (SAGE) https://www.iied.org/site-level-assessment-governance-equity-sage.

IUCN (2016). A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN.

https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf

IUCN-WCPA (2017). IUCN-WCPA Task Force on OECMs collation of case studies submitted 2016-2017. https://www.iucn.org/commissions/world-commission-protected-areas/our-work/oecms/oecm-reports

Joint Research Centre of the European Commission (JRC) (2021), The Digital Observatory for Protected Areas (DOPA) Explorer 4.1 [On-line], [Apr/2021], Ispra, Italy. Available at: http://dopa-explorer.jrc.ec.europa.eu

Kothari, A., et al. (Eds) (2012). Recognising and Supporting Territories and Areas Conserved By Indigenous Peoples And Local Communities: Global Overview and National Case Studies. Secretariat of the CBD, ICCA Consortium, Kalpavriksh, and Natural Justice, Montreal, Canada. Technical Series no. 64.

Lausche, B., Laur, A., Collins, M. (2021). *Marine Connectivity Conservation 'Rules of Thumb'* for MPA and MPA Network Design. Version 1.0. IUCN WCPA Connectivity Conservation Specialist Group's Marine Connectivity Working Group.

McDonald, R.I., Weber, K., Padowski, J., Flörke, M., Schneider, C., Green, P.A., Gleeson, T., Eckman, S., Lehner, B., Balk, D., Boucher, T., Grill, G., Montgomery, M., (2014). Water on an urban planet: Urbanization and the reach of urban water infrastructure. Global Environmental Change 27, 96–105. https://doi.org/10.1016/j.gloenvcha.2014.04.022

National Biodiversity Strategy and Action Plan (NBSAPs); most recent NBSAP is available at: https://www.cbd.int/nbsap/search/

Newbold, T., Hudson, L.N., Arnell, A.P., Contu, S., Palma, A.D., Ferrier, S., Hill, S.L.L., Hoskins, A.J., Lysenko, I., Phillips, H.R.P., Burton, V.J., Chng, C.W.T., Emerson, S., Gao, D., Pask-Hale, G., Hutton, J., Jung, M., Sanchez-Ortiz, K., Simmons, B.I., Whitmee, S., Zhang, H., Scharlemann, J.P.W., Purvis, A., (2016). Has land use pushed terrestrial biodiversity beyond the planetary boundary? A global assessment. Science 353, 288–291. https://doi.org/10.1126/science.aaf2201

Sala, E. et al. (2021). Protecting the global ocean for biodiversity, food and climate. Nature, 592(7854), 397-402. https://doi.org/10.1038/s41586-021-03496-1

Saura, S. et al. (2018). Protected area connectivity: Shortfalls in global targets and country-level priorities. Biological Conservation, 219, 53-67.

Saura, S. et al (2017). Protected areas in the world's ecoregions: How well connected are they? Ecological Indicators, 76, 144-158.

Spalding, M.D., et al. (2012). Pelagic provinces of the world: a biogeographic classification of the world's surface pelagic waters. Ocean & Coastal Management 60, 19–30.

Spalding, M.D., et al. (2007). Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. BioScience 57(7): 573–583.

Spawn, S.A., Sullivan, C.C., Lark, T.J., Gibbs, H.K., (2020). Harmonized global maps of above and belowground biomass carbon density in the year 2010. Scientific Data 7, 112. https://doi.org/10.1038/s41597-020-0444-4

Stolton, S. et al. (2014). The Futures of Privately Protected Areas. Gland, Switzerland: IUCN.

UNEP-WCMC and IUCN (2021) Protected Planet Report 2020. UNEP-WCMC and IUCN: Cambridge UK; Gland, Switzerland.

UNEP-WCMC and IUCN (2021), Protected Planet: The Global Database on Protected Area Management Effectiveness (GD-PAME) [On-line], [May/2021], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

UNEP-WCMC and IUCN (2021), Protected Planet: The World Database on Protected Areas (WDPA) [On-line], [May/2021], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

UNEP-WCMC and IUCN (2021), Protected Planet: The World Database on Other Effective Area-based Conservation Measures (WD-OECM) [On-line], [May/2021], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

UN Ocean Conference Voluntary Commitments, available at: https://oceanconference.un.org/commitments/

Williams, B.A., Venter, O., Allan, J.R., Atkinson, S.C., Rehbein, J.A., Ward, M., Marco, M.D., Grantham, H.S., Ervin, J., Goetz, S.J., Hansen, A.J., Jantz, P., Pillay, R., Rodríguez-Buriticá, S., Supples, C., Virnig, A.L.S., Watson, J.E.M., (2020). Change in Terrestrial Human Footprint Drives Continued Loss of Intact Ecosystems. One Earth 3, 371–382.

https://doi.org/10.1016/j.oneear.2020.08.009

This document was created using the knitr package with R version 4.0.5.

 $For any \ questions \ please \ contact \ support@unbiodiveristylab.org.$