RAINFORESTS AND FOREST PROTECTED AREAS IN WEST AFRICA

CURRENT SITUATION AND OUTLOOK

Funded by the European Union

UEMOA

LIST OF AUTHORS AND CONTRIBUTORS

COORDINATION

Barbara Haurez, Nature+
Marc Languy, PAPFor programme– Agreco

AUTHORS

Barbara Haurez, Nature+
Carlos de Wasseige, Collecte Localisation Satellites (CLS)
Cecilia Julve, Nature+
Cédric Vermeulen, Gembloux Agro-Bio Tech – University of Liege
Charles Bracke
Marc Languy, PAPFor programme – Agreco
Yda Alexis Nagalo, CERDE

CONTRIBUTION TO THE COMPILATION OF DATA ON FOREST PROTECTED AREAS (CHAPTER 3)

Alade Adeleke, PAPFor programme– RSPB
Andrew Dunn, PAPFor programme– WCS Nigeria
Inaoyom Sunday Imong, WCS Nigeria
Pacifique Kizila, PAPFor programme– WCF
Roberto Delbene, PAPFor programme– GIZ
Sheku Kamara, Conservation Society of Sierra Leone
Simon Burdett, PAPFor programme– Fauna & Flora
Sophie Jeanmart, Nature+
Tarik Bodasing, RSPB
Vincent Beligné, GIZ
Yacouba Magagi, PAPFor programme– UNOPS

SIDEBAR CONTRIBUTORS

Barbara Haurez, Nature+
Carlo Paolini, COWI
Cecilia Julve, Nature+
Edouard Coenraets, Gembloux Agro-Bio Tech – University of Liege
Luc Mathot, Conservation Justice
Marc Languy, programme PAPFor – Agreco
Paolo Roggeri, JRC
Vincent Beligné, GIZ
Nourou S. Yorou, Université de Parakou

MAPS

VisioTerra

Cover image:
Gola rainforest, Sierra Leone (© RSPB)

COMPILATION OF CARTOGRAPHIC DATA

Christian Cleon, GIZ
Hamath Ndiaye, Wild Chimpanzee Foundation
Harriet Branson, Fauna & Flora
James Mulbah, Society for the Conservation of Nature of Liberia
Jean-Frédéric Oberlin Youhouin

PROOFREADING AND LAYOUT

Cheikh Tidiane Kane
Emilie Hallard
Katharine Mill
Oliver Milner-Smith
Muriel Vives

ENGLISH TRANSLATION

Fintoni Translation

TO CITE THIS WORK

Haurez B., M. Languy, C. de Wasseige, C. Julve, C. Vermeulen, C. Bracke and Y.A. Nagalo (2024). *Rainforests and forest protected areas in West Africa: current situation and outlook.* AGRECO G.E.I.E. Belgium, 2024. ISBN: 978-2-931311-01-1

Manuscript completed in November 2024.
PRINT 978-2-931311-01-1
PDF 978-2-931311-03-5

The Support Programme for the Preservation of Forest Ecosystems in West Africa (PAPFor) was funded by the European Union in partnership with the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS), and implemented by AGRECO in consortium with GITEC-IGIP.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

TABLE OF SIDEBARS

LIST OF ACRONYMS

AAC	annual allowable cut
ACP	Africa, Caribbean and Pacific
ADK	name of a village in Côte d'Ivoire
ASM	artisanal and small-scale mining
AU	African Union
AZE	Alliance for Zero Extinction
BIOPAMA	Biodiversity and Protected Areas Management
BMZ	German Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung)
CBD	Convention on Biological Diversity
CEGENS	Mount Nimba and Simandou Environment Management Centre (Centre de Gestion de l'Environnement des Monts Nimba et Simandou)
CFI	Cocoa and Forests Initiative
CMA	Co-Management Agreement
CMC	Co-Management Committee
COP	Conference of the Parties
CRIKOT	Cross River – Korup – Takamanda
DOPA	Digital Observatory for Protected Areas
DRC	Democratic Republic of the Congo
EAGLE	Eco Activists for Governance and Law Enforcement
EcM	ectomycorrhizal
ECOWAS	Economic Community of West African States
ECOWAP	Economic Community of West Africa Agricultural Policy
ECOWEP	Economic Community of West Africa Environmental Policy

EDF	European Development Fund
EFI	European Forest Institute
EITI	Extractive Industries Transparency Initiative
ENNR	East Nimba Nature Reserve
ESIA	Environmental and Social Impact Assessment
EU	European Union
FAO	Food and Agriculture Organisation
FDA	Forest Development Authority (Liberia)
FFEM	French Facility for Global Environment (Fonds Français pour l'Environnement Mondial)
FLEGT	Forest Law Enforcement, Governance and Trade (EU programme)
FPIC	free, prior and informed consent
GEF	Global Environment Facility
GPS	Global Positioning System
GPSNR	Global Platform on Sustainable Natural Rubber
GRC-LG	Gola Rainforest Company limited by guarantee
GxABT	Gembloux Agro-Bio Tech
HCV	high conservation value
IBA	important bird area
IGA	income generating activity
IMET	Integrated Management Effectiveness Tool
IPCC	Intergovernmental Panel on Climate Change
IPLC	indigenous peoples and local communities
IUCN	International Union for the Conservation of Nature
JCFMB	Joint Community Forest Management Body
JRC	Joint Research Centre
KBA	key biodiversity area
KfW	German National Development Bank (Kreditanstalt für Wiederaufbau)
KLCD	key landscape for conservation and development
MAB	Man and the Biosphere
MEA	multilateral environment agreement
MINEDDTE	Côte d'Ivoire – Ministry of the Environment and Sustainable Development (Ministère de l'Environnement, du Développement Durable et de la Transition Écologique)
MoU	memorandum of understanding
NDC	Nationally Determined Contribution
NGO	non-governmental organisation
NNPS	National Park Service of Nigeria
NP	National Park
NPAA	National Protected Area Authority (Sierra Leone)
NTFP	non-timber forest products
OBAPAO	Regional Observatory for Biodiversity and Protected Areas in West Africa (*Observatoire régional pour la Biodiversité et les Aires Protégées en Afrique de l'Ouest*)
OECM	Other Effective (area-based) Conservation Measure
OFAC	Central Africa Forest Observatory (Observatoire des Forêts d'Afrique Centrale)
OIPR	Ivorian Office of Parks and Reserves (Office Ivoirien des Parcs et Réserves)
OKKPS	Outamba-Kilimi – Kuru – Pinselli – Soya
PA	protected area
PAG	development and management plan (Plan d'aménagement et de gestion)
PAGIET	Regional Support Programme for the Integrated Management of Transboundary Ecosystems (Programme Régional d'Appui à la Gestion Intégrée des Ecosystèmes Transfrontaliers)
PAPBio	Support programme for the preservation of biodiversity and fragile ecosystems, environmental governance and climate change in West Africa
PAPFor	Support programme for the preservation of forest ecosystems in West Africa

PARCC	Protected Area Resilience to Climate Change
PAU	WAEMU Agricultural Policy (Politique Agricole de l'Union)
PCF	Convergence Plan for the Sustainable Management and Conservation of Forest Ecosystems in West Africa
PPA	proposed protected area
PPP	public-private partnership
PES	payment for ecosystem services
RAMPAO	Regional network of marine protected areas in West Africa
REDD	reducing emissions from deforestation and forest degradation
REDD+	as above plus the inclusion of forest restoration and reforestation activities
RNV	voluntary natural reserve (réserve naturelle volontaire)
RSPO	Roundtable on Sustainable Oil Palm
SDG	Sustainable Development Goals
SFMF	sustainable forest management framework
SICE	Environmental Crime Information System (Système d'information sur la criminalité environnementale)
SMART	spatial monitoring and reporting tool
SWOT	strength, weaknesses, opportunities and threats
TBCA	transboundary conservation area
TGKS	Taï – Grebo-Krahn – Sapo
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WABiLED	West Africa Biodiversity and Low Emissions Development Program
WAEMU	West African Economic and Monetary Union
WCF	Wild Chimpanzee Foundation
WCMC	World Conservation Monitoring Centre
WCS	Wildlife Conservation Society
WDPA	World Database on Protected Areas
WHS	World Heritage Site
WWF	World Wide Fund for Nature
WWZ	Wologizi-Wonegizi-Ziama

0

SUMMARY

-

0

SUMMARY

The forest in Bossou, a village in the foothills of Mount Nimba, Guinea, is home to an important chimpanzee population. (INTERFOTO / Alamy Stock Photo)

The dense rainforests of West Africa, known as the Guinean forests, are an exceptional biodiversity hotspot stretching from Guinea to southwest Cameroon. They bring together a wide variety of tropical forest ecosystems, including highland forests, lowland forests and mangroves, among others. Their biodiversity is remarkable for its richness of species and high rate of endemism. However, many species have yet to be discovered and described. Emblematic threatened species include the forest elephant, chimpanzee, pygmy hippopotamus and Cross River gorilla, to name but a few.

However, Guinean forests have lost 85 % of their original area as a result of heavy pressure from deforestation. The main causes are extensive agriculture for cash and food crops, to the detriment of the forest; industrial and small-scale logging, mining, and infrastructure expansion and urbanisation. Fuelwood collection, charcoal production and hunting are also threats of forest degradation. Climate change exacerbates these pressures through its direct and indirect effects on ecosystems. These numerous threats are underpinned by strong population growth in a difficult socioeconomic context.

Among the responses to this deforestation, governments have set up nearly 200 protected areas covering 36 600 km^2, ensuring the protection of part of these threatened forests. An important part of this document gives an overview of the status of the 30 most important protected forest areas. However, support for these protected areas is increasingly based on a broader, holistic approach: a landscape approach integrating conservation and development. Six priority cross-border landscapes for conservation and development contain the majority of Guinean forests and their biodiversity, and include the protected areas considered to be priorities: Outamba-Kilimi – Kuru Hills – Pinselli – Soyah (OKKPS, shared between Guinea and Sierra Leone), Gola (Sierra Leone and Liberia), Wologzi-Wonegizi-Ziama (WWZ, Liberia and Guinea), Nimba (Guinea, Liberia, and Côte d'Ivoire), Taï – Grebo-Krahn – Sapo (TGKS, Liberia and Côte d'Ivoire), and Cross River (Nigeria and Cameroon). Similar operations are being prepared in Ghana and Togo.

At the political level, the African Union has adopted Agenda 2063, advocating sustainable development for Africa. The Economic Community of West African States (ECOWAS)

has an environmental policy and a convergence plan for sustainable forest management (PCF), and the West African Economic and Monetary Union (WAEMU) also supports a concerted approach to conservation policies for protected areas in West Africa. through its common policy for environmental improvement (PACE) and its regional support programme for the integrated management of transboundary ecosystems (PAGIET). These initiatives receive financial support from the European Union, the United States Agency for International Development (USAID), the German National Development Bank (KfW), the French Facility for Global Environment (FFEM), and the Global Environment Facility (GEF), as well as from foundations and international and local non-governmental organisations (NGOs).

Conservation goes beyond protected areas, with cross-border priority landscapes, ecological corridors and the increasing involvement of local communities, through co-management approaches, sharing the benefits of tourism, developing income-generating activities, raising awareness and education. Research institutes also support the ecological monitoring of protected areas.

Although many challenges remain, there are real opportunities for the conservation of these exceptional forests. Advantages include protected areas that are still home to emblematic and endemic species, governments that are aware of the issues, inclusive approaches that have proved their worth, renewed interest in these unique ecosystems, and the realisation that conservation and development are intimately linked.

This document provides a basis for setting up an effective management framework for the dense rainforests of West Africa. It highlights the forces at work for the conservation of this unique biodiversity hotspot, which could disappear without major mobilisation. The protected areas and priority landscapes identified form a network on which to build an ambitious vision for the conservation of these forest ecosystems and their remarkable biodiversity. The political and financial support of the international community will be crucial to making this vision a reality and ensuring the long-term survival of this irreplaceable natural heritage.

PREFACE OF THE WAEMU COMMISSION

The state of West Africa's dense rainforests and forest protected areas is a fascinating subject. The region's forest ecosystems, teeming with a priceless treasures of biodiversity, play a vital role not only in preserving numerous endemic species, but also in combating climate change, thereby contributing to the resilience of this natural heritage and the populations living alongside them.

This book, the first of its kind for the West African region, sets out to take stock of these conserved areas, highlighting their ecological, economic and cultural importance. These natural habitats are home to an exceptional wealth of flora and fauna, from large emblematic mammals to rare plants, as well as a multitude of endemic species. These areas play a crucial role both in preserving ecosystems and in maintaining the global climate balance as major carbon sinks.

However, these natural treasures are currently facing a multitude of threats, mainly man-made. Agricultural expansion, illegal logging, poaching and other forms of environmental crime, population growth, urbanisation and climate change are exerting increasing pressure on these fragile ecosystems.

Faced with these challenges, the need to sustainably protect and restore these dense rainforests and forest protected areas has never been more urgent, as they play a key role in providing sanctuary for plants and animals, as well as delivering a range of ecosystem services. It is therefore vital that we continue to raise awareness among decision-makers and all stakeholders of the need to preserve and sustainably enhance these natural areas for the benefit of current and future generations, through a more inclusive and responsible involvement of local communities.

This book explores the challenges and opportunities associated with the sustainable management of West Africa's forests. The contribution of the major environmental policies and strategies promoted by West African intergovernmental organisations (WAEMU, ECOWAS) has also been highlighted through the regional initiatives deployed to preserve these natural habitats and their biodiversity, with particular emphasis on the involvement of local communities. These various initiatives seek to reconcile, through a holistic and inclusive approach, the need to preserve the environment with the legitimate aspiration for endogenous socio-economic development.

The result of collaboration between many stakeholders and conservationists, this book offers a comprehensive and nuanced view of the current state of West Africa's rainforests and forest protected areas.

It is also a call to collective responsibility and action. It reminds us that every decision we make today will have repercussions for the future of these vital ecosystems. The loss of these forests would be a tragedy, not only for the biodiversity and ecosystem services they provide, but also for the millions of people who depend directly or indirectly on their resources for their livelihoods and well-being. Forests know no borders; protecting and restoring them requires concerted efforts at local, national, regional and even international levels.

We hope that this book will help to raise a collective awareness and encourage concrete action to preserve this natural heritage. Whether through research, innovation, awareness-raising or the implementation of appropriate policies, every effort counts in the fight to safeguard our rich natural heritage. It's a call to action to preserve and enhance these unique areas for present and future generations. The task is immense, but the inestimable wealth represented by these forests justifies every effort made to preserve them.

May this book serve not only as a guide and reference, but also as a source of inspiration for all those working to protect our dense rainforests and to conserve and sustainably enhance the biodiversity of West Africa.

Happy reading!

Mahamadou GADO

–

Commissioner in charge of the Department of Agriculture Water Resources and the Environment
WAEMU Commission

PREFACE OF THE DELEGATION OF THE EUROPEAN UNION TO BURKINA FASO

The European Union has long recognised the crucial importance of tropical forests, and in particular the Guinean forests of West Africa, in regulating global climate, maintaining essential environmental services and preserving global biodiversity.

These forests, which stretch from Guinea to Cameroon, have undergone severe deforestation. Indeed, over the last twenty years, more than 20% of this cover has disappeared, mainly due to agriculture, both subsistence and industrial (cocoa, coffee, oil palm, etc.), demand for timber and fuelwood and extraction of mineral resources, all compounded by increasing population density.

Biodiversity loss threatens not only species, but also opportunities for sustainable development and cultural preservation.

To address this situation, UEMOA and the European Union launched the Regional Support Programme for the Preservation of Forest Ecosystems in West Africa (PAPFor), financed by the 11th European Development Fund. The programme, active from 2019 to 2025, aims to protect biodiversity in six key forest landscapes. It integrates local communities in the management of protected areas and promotes sustainable socio-economic activities on the periphery of these zones.

As a result of this programme, the present document presents an overview of West Africa's dense rainforests, with the aim of raising awareness and disseminating effective, sustainable forest management practices.

By supporting the sustainable management of these forest ecosystems, the PAPFor programme contributes to the efforts of West African nations to expand and protect their networks of protected areas.

These efforts by West African countries are made in partnership with those of the EU and its Member States to contribute to the objectives of the Kunming-Montreal Global Biodiversity Framework. This global framework aims to ensure that 30 % of the Earth's land and ocean area is effectively conserved and sustainably managed by 2030.

The PAPFor programme is also aligned with the UEMOA Regional Strategy for the Management of Protected and Conserved Areas in West Africa to 2050, adopted in October 2024.

EU support is complemented by backing for the Observatory for Biodiversity and Protected Areas in West Africa (OBAPAO) and the Digital Observatory of Protected Areas (DOPA), which track conservation progress and analyse scenarios for effective natural resource management.

Building on these efforts, the EU has just launched a new programme, NaturAfrica, funded by the NDICI - Global Europe European Cooperation Instrument, which builds on the lessons and results of PAPFor to make ecosystems more resilient, new opportunities for the green economy and more appropriate governance in West Africa.

The preservation of Guinean forests is vital in the face of the challenges of climate change and biodiversity erosion. UEMOA and the European Union are determined to continue their support, while working with local governments and communities to ensure a sustainable future for the forests and the people who depend on them.

The present document bears witness to all these efforts to achieve the goals of sustainability and biodiversity conservation for future generations.

Daniel ARISTI GAZTELUMENDI
Ambassador
Delegation of the European Union to Burkina Faso

1

INTRODUCTION

1

INTRODUCTION

Tropical forests play essential roles in regulating climate, maintaining environmental services and ecological processes, and conserving global biodiversity. Their environmental, social and economic benefits are well established. Unfortunately, they are facing increasing threats of degradation and destruction.

The dense rainforests of West Africa, or Guinean forests, stretch from Guinea to the west of Cameroon. They have paid a particularly heavy price for the economic development of Africa's forests, having been reduced to 15 % of their original cover. This deforestation, which began in the 19th century, has continued into the 21st, with a steady loss of forest cover (more than 20 %) over the last two decades. This disappearance and fragmentation of natural ecosystems is the result of various factors, supported by a high and growing population density: subsistence and industrial agriculture (cocoa, coffee, oil palm, rubber trees), demand for timber and firewood, extraction of mineral resources, etc. The forests are being emptied of their fauna and many species are now threatened with extinction. With them disappear opportunities for development and employment, as well as ancestral cultures.

There is, therefore, an urgent need to slow down – and ultimately halt – the disappearance of these forests, while promoting sustainable solutions to maintain them, with and for the benefit of local communities.

It is with this objective in mind that the European Union set up, under the aegis of the WAEMU and ECOWAS Commissions, the Regional Support Programme for the Preservation of Forest Ecosystems in West Africa (PAPFor), financed through the 11th European Development Fund (EDF) over the period 2019-2024. This programme has been active in six forest landscapes recognised as priorities for conservation and development in West Africa: Outamba-Kilimi – Kuru Hills – Pinselli – Soyah (OKKPS), Gola – Foya – Lofa (Gola), Wologizi – Wonegizi – Ziama (WWZ), Mount Nimba (Nimba), Taï – Grebo-Krahn – Sapo (TGKS), and Cross River. The PAPFor programme aimed to effectively protect biodiversity and forest ecosystems within these landscapes, through the implementation of effective protected area management systems involving neighbouring communities, and the development of socioeconomic and environmental activities compatible with conservation on the periphery of protected areas.

FIGURE 1 The PAPFor programme's six forest landscapes

In addition to coordinating activities across the six cross-border landscapes, PAPFor provided significant support in terms of increasing knowledge of Guinean forests and raising awareness of their value among various audiences. This publication is part of this objective and aims to provide an overview of the dense rainforests and forest protected areas of West Africa, both in terms of their conservation values and the threats they face.

Following this first introductory chapter, Chapter 2 gives a detailed account of the state of the Guinean forests of West Africa. It describes the different ecoregions they are composed of and the animal species they support. One section describes the diversity of human populations living in and around these forests. In relation to these human populations, the main threats to Guinean forests are detailed. Finally, the most active deforestation fronts and the remaining forest blocks with resilience potential are described.

Chapter 3 focuses on descriptions of the protected areas included in the landscapes of the PAPFor programme and a few additional protected areas chosen for their conservation value. For each protected area, a factsheet has been developed that includes the general characteristics of the site, its main conservation values, the most significant threats it faces, and management recommendations until 2030. The Integrated Management Effectiveness Tool (IMET) for monitoring the status of protected areas is also presented.

The global and regional policies governing the management of West Africa's dense rainforests are discussed in Chapter 4, which also presents the observatories and study centres involved in monitoring these forests.

Chapter 5 concludes with a review of the various approaches relevant to the conservation of protected areas and, more generally, to the sustainable management of tropical forests. These approaches are illustrated by case studies from the landscapes of the PAPFor programme.

This document is therefore more than just an inventory of Guinean forests and protected forest areas in West Africa. As well as being a reference point for future programmes, such as NaturAfrica West Africa, GEF and USAID, it is also intended as a tool for disseminating effective management practices and could be a rallying point for forest management stakeholders in the region.

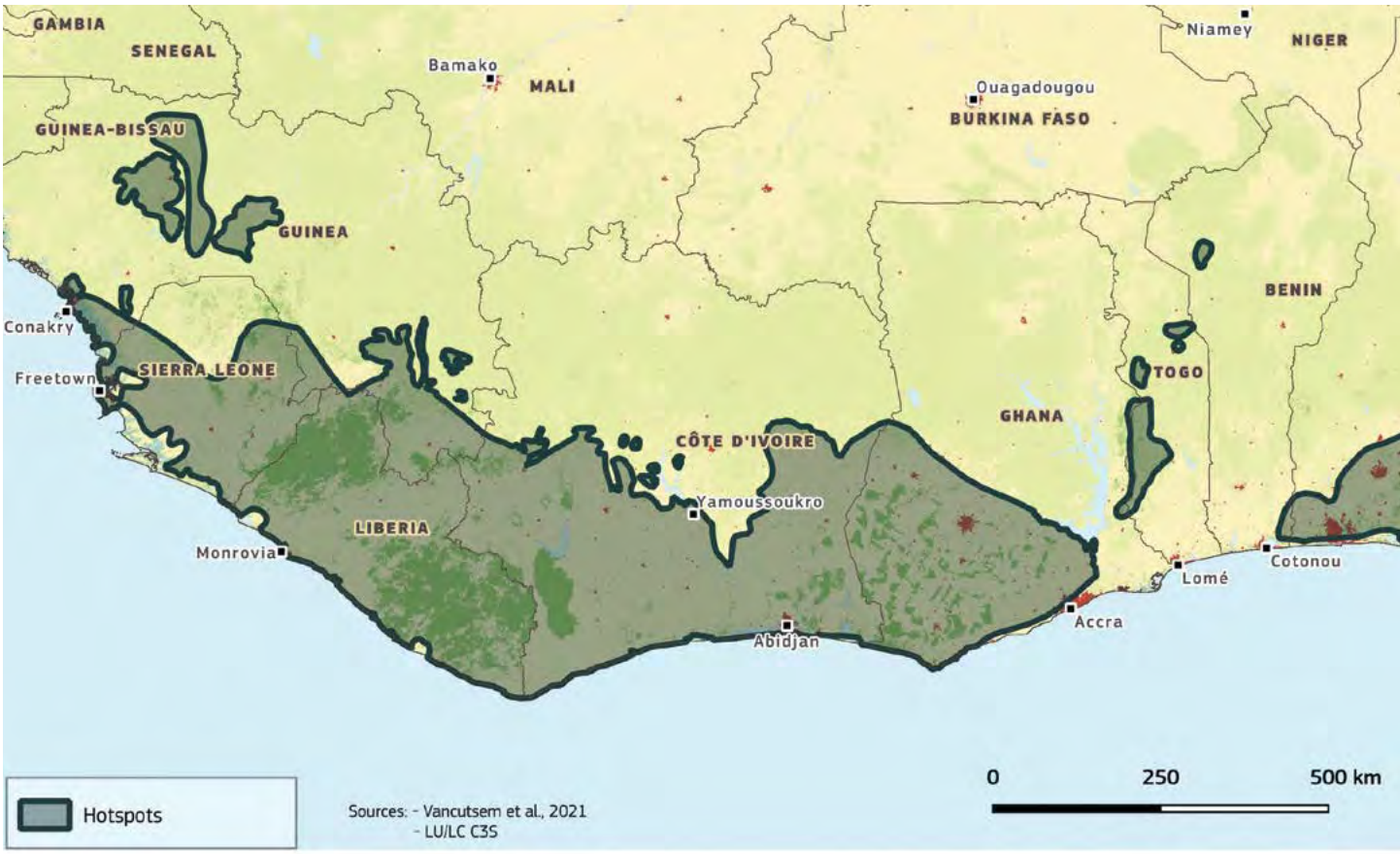
2

THE STATE OF WEST AFRICA'S DENSE RAINFORESTS

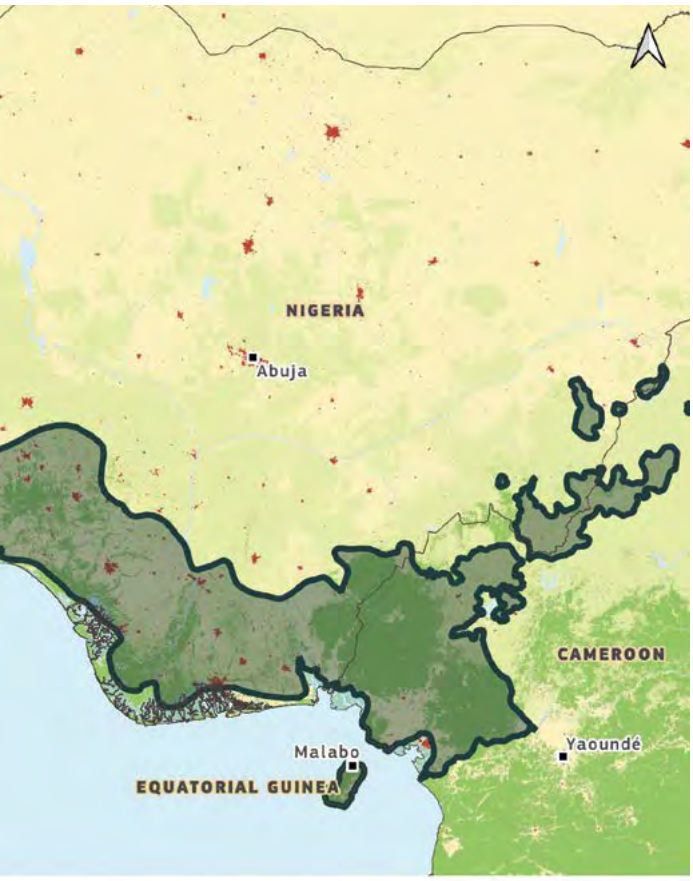
2

THE STATE OF WEST AFRICA'S DENSE RAINFORESTS

FIGURE 2 The Guinean Forests of West Africa biodiversity hotspot



Source : Critical Ecosystem Partnership Fund.
https://www.cepf.net/our-work/biodiversity-hotspots/guinean-forests-west-africa



FORESTS THAT ARE RICH AND USEFUL, BUT FRAGMENTED AND UNDER THREAT

The dense rainforests of West Africa are the biodiversity hotspot of the Guinean forests. They are considered a priority area for conservation on a global scale due to their great biodiversity, particularly of mammals, and their high level of plant and animal endemism. Although these forests also provide a large number of environmental and economic services, they are under a great deal of pressure, including significant loss to forest cover.

The Guinean forests stretch along the West African coast from Guinea to southwest Cameroon, passing through Liberia, Côte d'Ivoire, Ghana and Nigeria (Figure 2). The current surface area still under forest cover – around 93 047 km² – represents only 15 % of the original surface area of 620 314 km². The region's extremely high level of deforestation, both past and present, is causing the remaining forests to fragment. It is also one of the most economically developed regions in Africa, with the highest density of human population and thus human activity, resulting in great pressure on land use.

The relatively flat terrain of West Africa's dense forests also includes some mountain ranges: the Fouta Djallon massif in Guinea, the Mount Nimba massif on the shared border between Liberia, Guinea and Côte d'Ivoire, and the Mambila mountain range, which includes Mount Cameroon (4 040 m) near the border between Nigeria and Cameroon.

FIGURE 3 The limits of the Guinean Forests biodiversity hotspot and the ecoregions of West Africa

The climate is humid tropical, with high average annual temperatures; these tend to fall along the coast and rise inland, but the range is relatively small for any given site. Rainfall varies more markedly throughout the year, divided between a dry season and a rainy season.

The length and rhythm of the seasons vary somewhat along a north-south gradient, but follow a similar pattern: in the latitudes north of the equator, there is a long rainy season from May/June to September/October and a dry season from November to April; closer to the equator, the same pattern is observed but there is a short dry season, or at least a respite in rainfall, in July/August.

Average annual rainfall also varies between coastal areas and inland areas, ranging from between 3 000 and 3 500 mm to 1 500 and 2 000 mm respectively, with rainfall volumes linked to the relief effect of the coast and mountainous hinterlands (Fouta Djallon, Nimba, Mount Cameroon) for oceanic monsoon flows. However, certain localised areas receive much higher amounts of rainfall, up to 10 000 mm per year in the Mount Cameroon region.

2.1 DIVERSITY OF GUINEAN FOREST ECOSYSTEMS IN WEST AFRICA

The Guinean forests are part of the Afrotropics biogeographical realm that is sub-Saharan Africa and the island of Madagascar, and more specifically the Equatorial Afrotropics sub-realm. According to the classification proposed by the non-governmental organisation (NGO) OneEarth[1] (an update of the classification established by the World Wide Fund for Nature, WWF), they are included in two bioregions: the coastal forests and savannahs of West Africa (bioregion AT19), corresponding to Upper Guinea; and the coastal forests and mangroves of the Gulf of Guinea (bioregion AT17), corresponding to Lower Guinea. These two bioregions are separated by the Dahomey Gap, a less humid zone made up of dry forests and savannahs, not included in the Guinean forests. The different ecosystems (or ecoregions[2] according to the OneEarth classification) found in the Guinean forests are as follows:

- The Guinean montane forests or Guinean highland forests (ecoregion 14) in Upper Guinea;
- Lowland forests: those of the western Gulf of Guinea (ecoregion 30) and the forests of eastern Guinea (ecoregion 11) in Upper Guinea; and the forests of the Nigerian lowlands (ecoregion 23), the swamp forests of the Niger Delta (ecoregion 22), the transition forests of the Cross-Niger (ecoregion 6) and the Cross-Sanaga-Bioko coastal forests (ecoregion 7) in Lower Guinea;
- Mangroves: Guinean mangroves (ecoregion 113) in Upper Guinea and Central African mangroves (ecoregion 111) in Lower Guinea.

With the exception of the Cross-Sanaga-Bioko coastal forests, which are classified as vulnerable, all the ecoregions that are home to West Africa's dense rainforests are considered threatened or even critically endangered.

1 See oneearth.org/realms/afrotropics. The new classification of ecoregions is based on and replaces the preceding WWF classification ('Global ecoregions', see https://www.worldwildlife.org/ecoregions).

2 An ecoregion is defined as a large terrestrial or aquatic unit containing characteristic assemblages of animal and plant species, habitats and ecological processes. Its boundaries were determined by natural features prior to the significant development of human influences.

The Mount Nimba range straddles the borders of Guinea, Côte d'Ivoire and Liberia. (© M. Languy)

2.1.1 THE FOREST ECOSYSTEMS OF UPPER GUINEA

GUINEAN MONTANE FORESTS

Guinea's highland forests still cover almost 31 120 km², spread between Guinea, Sierra Leone, Liberia and Côte d'Ivoire. Located at altitudes of 600 m and above, these forests are made up of a series of mountain peaks and high plateaus, contrasting with the surrounding lowland forests and savannahs. The highest point is the Bintumani Peak (in the Loma Mountains) in Sierra Leone (1 947 m), while other peaks are between 1 387 and 1 860 m in altitude. The soils are generally not very fertile, although there are localised mineral deposits, notably of iron on Mount Nimba (1 752 m) and on the Fouta Djallon plateau (at an altitude of around 1 100 m). This ecoregion is also home to the sources of West Africa's major rivers.

Average annual rainfall varies between 1 600 and 2 400 mm, with a marked contrast between the southern slopes facing the Atlantic Ocean, which are characterised by their humidity, and the drier northern slopes, which are subject to the influence of the Harmattan[3] between November and March. Temperatures in the region vary greatly, especially depending on altitude, fluctuating from 10 to 33 °C.

The characteristic vegetation of Guinean montane forests is marked by epiphytes, plants that grow on trees, including many species of orchid, which proliferate above 1 000 m in the zone where the forest is regularly invaded by clouds. Although the vegetation in this ecoregion has been little studied outside Mount Nimba, the level of endemism appears to be very high (at least 35 endemic plant species and 11 paleoendemic species[4]). The characteristic wood

3 The Harmattan is a dry, often dusty, seasonal wind that blows southwest from the Sahara. It is present in the Gulf of Guinea from late November to mid-March.
4 Paleoendemic species were initially widely distributed but their current range is reduced.

An orchid in the East Nimba Nature Reserve, Liberia. (© M. Languy)

species of Mount Nimba, at an altitude of over 800 m, are *Parinari excelsa, Gaertnera paniculata, Garcinia polyantha* and *Syzygium staudtii*. The sub-montane gallery forests of Mount Loma are home to *Anthonotha macrophylla, Pseudospondias microcarpa, Allanblackia floribunda, Terminalia ivorensis* (framire) and *Mussanga cecropioides* (umbrella tree). At these higher altitudes there are also plant formations dominated by bamboo (*Oxythenanthera abyssinica*), high-altitude grasslands (the expansion of which may be associated with man-made fires), and wetlands. At lower altitudes, *Parinari excelsa* is associated with *Uapaca togoensis, Cola lateritia var. maclaudii, Piptadeniastrum africanum* (dabéma), *Canarium schweinfurthii* (aiélé), and certain species outside their ranges such as *Guarea cedrata* (light bossé), *Heritiera utilis* (niangon) and *Triplochiton scleroxylon* (samba). The regularly burnt savannahs are dominated by *Parkia biglobosa* (néré), *Lophira lanceolatae* and *Pterocarpus erinaceus* (African rosewood).

Guinea's high-altitude forests are home to two emblematic and threatened animal species: the West African chimpanzee (*Pan troglodytes* ssp. *verus*) and leopard (*Panthera pardus*). Several endemic mammal species have been recorded in the region, including the Nimba otter shrew (*Micropotamogale lamottei*, a shrew-like species), two species of shrew (*Crocidura obscurior* and *Crocidura nimbae*), and two species of bat (*Hipposideros lamottei* and *Myotis nimbaensis*). In addition, there are at least four amphibian species that are endemic to this ecoregion: Nimba toad (*Nimbaphrynoides occidentalis*), Ziama (*Odontobatrachus ziama*) and Arndt (*Odontobatrachus arndti*) toothed frogs, and Nimba reed frog (*Hyperolius nimbae*). Avifauna diversity is also high, with the endemic Sierra Leone prinia (*Schistolais leontica*) in danger of extinction. Finally, this ecoregion is notable for its wealth of butterflies and moths, with many endemic species such as *Aslauga larseni, Cephetola wologizi* and *Cephetola wingae* to name but a few.

Canopy of the Gola rainforest, Sierra Leone. (© RSPB)

LOWLAND FORESTS OF THE WESTERN GULF OF GUINEA

The lowland forests of the western Gulf of Guinea are found in Guinea, Sierra Leone, Liberia and Côte d'Ivoire and cover an area of 205 560 km². Bounded to the east by the Sassandra River, they extend at low altitudes, from 0 to 500 m, with a few isolated peaks reaching higher altitudes. In general, the soil is low in fertility and heavily leached, with the exception of alluvial zones in the valleys and marshy areas where farming is practised.

Rainfall is among the highest in West Africa, with average annual rainfall reaching 3 300 mm, and even exceeding 5 000 mm on the Freetown Peninsula. There is a dry season from November to April, with June and July being the wettest months. Temperatures are high, with minimums between 12 and 21 °C and maximums between 30 and 33 °C.

The coastal areas are home to evergreen forests, characterised by higher humidity, while semi-deciduous forests are more widespread inland. Riparian forests and swamps are also present, linked with the hydrographic network. However, slash-and-burn agriculture is leading to the degradation of forested areas into bushy fallow land. Plant diversity in the lowland forests of the western Gulf of Guinea is remarkably high, as is the level of endemism. The ecoregion is home to a family of endemic lianas, the Dioncophyllaceae.

These forests abound in characteristic wood species such as *Dacryodes klaineana, Strombosia glaucescens, Allanblackia floribunda, Coula edulis* (African hazel tree) and *Diospyros sanza-minika*. The evergreen forests contain species exploited for their wood, such as niangon (*Heritiera utilis*), tali (*Erythrophleum ivorense*), azobe (*Lophira alata*) and dabema (*Piptadeniastrum africanum*), while iroko (*Milicia excelsa*), frake (*Terminalia superba*) and *Entandrophragma* spp. are found in semi-deciduous forests.

The fauna is also characterised by a high level of endemism. Among the mammal species endemic to this ecoregion are a number of primates, including Diana monkey (*Cercopithecus diana*), western red colobus (*Piliocolobus badius*), sooty mangabey (*Cercocebus atys*), but also the endangered Jentink's duiker (*Cephalophus jentinki*), zebra duiker (*Cephalophus zebra*), Liberian mongoose (*Liberiictis kuhni*) and Leighton's oyan (*Poiana leightoni*), as well as numerous species of amphibians including Merlin's dwarf clawed frog (*Pseudhymenochirus merlini*) and the Mount Aureol squeaker (*Arthroleptis aureoli*). Emblematic threatened species such as the forest elephant (*Loxodonta cyclotis*), West African chimpanzee (*Pan troglodytes verus*), leopard (*Panthera pardus*), pygmy hippopotamus (*Choeropsis liberiensis*) and yellow-headed picathartes (*Picathartes gymnocephalus*) are also present.

The Cavally Nature Reserve, in the north of the Grebo-Krahn National Park in Côte d'Ivoire. (© M. Languy)

FORESTS OF EASTERN GUINEA

The forests of eastern Guinea are found in Côte d'Ivoire and Ghana, to the east of the lowland forests of the western Gulf of Guinea, on the other side of the Sassandra River, and extend as far as Lake Volta. Covering an area of 190 130 km², they are bounded to the east by the Dahomey Gap, which separates the forests of Upper Guinea from those of Lower Guinea. Most of them are at low altitude, between 0 and 300 m, with inselbergs, isolated rocky mountains with steep slopes and no vegetation at their summit, reaching over 400 m.

Average annual temperatures vary between 22 and 34 °C. The dry season is more pronounced than in the lowland forests of the western Gulf of Guinea, and annual rainfall is less abundant, not exceeding 2 500 mm.

In the southern forests of eastern Guinea, characteristic wood species include sipo (*Entandrophragma utile*), mahogany (*Khaya ivorensis*) and samba (*Triplochiton scleroxylon*), three species exploited for their timber. In the north, African walnut (*Mansonia altissima*), kotibe (*Nesogordonia papaverifera*), iroko (*Milicia excelsa*) and lotofa (*Sterculia rhinopetala*) are exploited for the same purpose. Other species include *Celtis* spp. and *Pterygota macrocarpa*.

Very small populations of pygmy hippopotamus (*Choeropsis liberiensis*) and forest elephant (*Loxodonta cyclotis*), both endangered species, remain within the ecoregion. Part of the Guinean-Congolese endemism centre, this area is home to a multitude of butterfly species. Four species of rodent, namely Wimmer's shrew (*Crocidura wimmeri*), the Ivory Coast rat (*Dephomys eburneae*), Candale's swamp rat (*Malacomys cansdalei*) and the Togo mouse (*Leimacomys buettneri*) are also endemic to this region, with their distribution limited to a small area on the border between Ghana and Togo.

In Côte d'Ivoire and Ghana, numerous forest patches are preserved because they are sacred to the local populations.

GUINEAN MANGROVES

The Guinean mangroves stretch along the coasts of Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia and Côte d'Ivoire, covering a total area of 23 570 km². The presence of mangroves is linked to the combination of high tides and flat topography, which allow salt water to reach great distances inland.

Minimum temperatures fluctuate between 15 and 23 °C, and maximum temperatures between 28 and 32 °C, with the lowest values observed in the north of the ecoregion. Average annual rainfall is highly variable, reaching up to 3 000 mm in Sierra Leone, while in the Senegal River Delta it does not exceed 100 mm. The mangrove ecosystem is strongly influenced by rainfall, which reduces water salinity to its lowest levels during the rainy season. During the dry season, a higher salinity is observed further upstream in the hydrographic network.

Mangroves in Liberia. (© M. Languy)

The particular ecosystem of mangroves is associated with the presence of halophilic plant and animal species (tolerant of high salinity levels). Several species of mangrove characterise this plant formation: red mangrove (*Rhizophora racemosa, R. mangle, R. harrisonii*) are found close to the sea in areas with high water levels, black mangrove (*Avicennia germinans*) in shallow areas, and white mangrove (*Laguncularia racemosa*) and grey mangrove (*Conocarpus erectus*) in dry, inland areas. Mangroves in flooded areas are trees and shrubs with organs adapted to amphibious environments: aerial roots and stilt roots, which anchor them to the ground, and pneumatophores, which are root outgrowths protruding vertically from the ground facilitating the necessary aeration.

The endangered African manatee (*Trichechus senegalensis*) is one of the species present in this ecoregion, which is home to one of the largest populations in Guinea-Bissau. Other animal species found in the area include the African dwarf crocodile (*Osteolaemus tetraspis*), the Nile monitor (*Varanus niloticus*), water chevrotain (*Hyemoschus aquaticus*) and Campbell's monkey (*Cercopithecus campbelli*). Several species of marine turtles are present here and come to lay their eggs on the beaches. The Guinean mangroves are also a breeding ground for many species of fish and a stopover for migratory waterfowl.

The ecological functions and ecosystem services provided by mangroves are considerable: protection of the land against erosion, floods and storms, recycling organic matter, sequestration of large quantities of carbon, spawning grounds, etc. They are often home to ethnolinguistic groups whose fishing practices represent important cultural values for protected areas.

2.1.2 THE FOREST ECOSYSTEMS OF LOWER GUINEA

FORESTS OF THE NIGERIAN LOWLANDS

The forests of the Nigerian lowlands are located in southwestern Nigeria and extend as far as Benin, along the coast, covering 67 480 km². They are bounded by the Niger River Delta to the east and drier vegetation formations associated with the Dahomey Gap to the west. They consist of a coastal plain, interspersed with a few inselbergs, with a maximum altitude of 150 m. The soils in the area are moderately to heavily leached, well drained and have a low to medium humus content.

Average annual temperatures fluctuate between 24 and 28 °C. Rainfall is higher in the south (2 000 to 2 500 mm per year) than in the north (1 500 to 2 000 mm per year), resulting in a vegetation gradient ranging from dense evergreen forest in the wetter zone to deciduous forest in the drier zone. Regular human fires have converted part of

The Omu river flows through the Omu Forest Reserve in south-west Nigeria. (Fela Sanu / Shutterstock)

the deciduous forest into grassland. The dry season runs from December to February.

The humid forest in the south is dominated by wood species belonging to the Fabaceae family, for example okan (*Cylicodiscus gabunensis*) and white tola (*Pioria balsamifera*), two species exploited for their wood, various species of the *Brachystegia* spp. genus, and the Meliaceae family, for example species of the *Entandrophragma* genus, also exploited for their wood. In the deciduous forest to the north of the ecoregion, the Malvaceae family – notably samba (*Triplochiton scleroxylon*) and kotibe (*Nesogordonia papaverifera*), again exploited for their wood, the Moraceae family – iroko (*Milicia excelsa*) and various species of *Ficus* spp., and the Ulmaceae family predominate. The area is not characterised by a high rate of endemism, but its location on the border between Upper and Lower Guinea gives it unusual plant associations, bringing together species from both bioregions.

Forest elephant (*Loxodonta cyclotis*) and the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*) are found in the forests of the Nigerian lowlands, alongside endemic species threatened with extinction, such as the Ibadan malimbe (*Malimbus ibadanensis*). Four other endemic vertebrate species inhabit the ecoregion: red-bellied monkey (*Cercopithecus erythrogaster*), crested genet (*Genetta cristata*), the Ondo forest gecko (*Cnemaspis petrodroma*) and Perret's toad (*Bufo perreti*).

SWAMP FORESTS OF THE NIGER DELTA

The swamp forests of the Niger Delta cover 14 440 km² within Nigeria and constitute the second largest swamp forest massif in Africa. They are located between the town of Aboh (to the north), the Benin River (to the west), the Imo River (to the east) and a strip of mangroves along the coast (to the south). The soils are predominantly clayey and waterlogged, covered with peat in the lowlands and made up of silt and clay at higher altitudes.

The climate is divided between a dry season from November to February and a rainy season from March to October. Average annual rainfall is around 2 500 mm in the north, rising to 4 000 mm on the coast, with an average annual temperature of 28 °C.

In addition to tidal movements and the flooding of the Niger, rainfall determines the plant formations present. The periodically flooded forest (from October to December) is rich in *Uapaca* spp., a tree characteristic of marshy areas, and azobé (*Lophira alata*), whose wood is used for hydraulic engineering; ilomba (*Pycnanthus angolensis*) and akpi (*Ricinodendron heudelotii*), are two species whose fruits and seeds are used by local people to make sauces. The oil palm (*Elaeis guineensis*) is also naturally common here. Little is known about the vegetation on the eastern side of the delta, while the central swamp zone is the most extensively studied. It contains drier areas with a fairly high diversity of species, dominated by the Euphorbiaceae

*The crested chameleon (*Trioceros cristatus*) is one of three near-endemic vertebrates found in the Cross River ecoregion. (Chris Mattison / Alamy Stock Photo)*

(*Uapaca* spp., *Klaineanthus gaboniae, Macaranga* spp.), Annonanceae (*Xylopia* spp., *Hexalobus crispiflorus*), Guttiferae (*Symphonia globulifera, Pentadesma buteraceae*), Rubiaceae and Myristicacea. The bahia (*Mitragyna ledermannii*), a swamp species, is now rare, following massive logging for its wood. Although there are no endemic plants in the area, the plant community is considered unique in that it combines species from Upper and Lower Guinea.

Forest elephant (*Loxodonta cyclotis*), the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*), and the critically endangered Niger Delta red colobus (*Piliocolobus epieni*) are found here, while the population of the Niger Delta pygmy hippopotamus (*Choeropsis liberiensis heslopi*), formerly endemic to the area and a subspecies of the pygmy hippopotamus, is now extinct. The Niger Delta is a centre of endemism for animal species: two endemic and threatened primates, the red-bellied monkey (*Cercopithecus erythrogaster*) and Sclater's monkey (*Cercopithecus sclateri*), are found in the area, as are probably other endemic (sub)species. Walter's duiker (*Philantomba walteri*), recently identified as a separate species from Maxwell's duiker (*Philantomba maxwelli*), is also thought to be present.

TRANSITION FORESTS OF THE CROSS-NIGER

Located in Nigeria between the Niger River (to the west) and the Cross River (to the east), the transitional forests of the Cross-Niger have a gentle, undulating relief, although it becomes more mountainous towards the north. They cover just 20 770 km² and are one of the most threatened forest ecoregions in West Africa.

Once again, the differentiation of plant formations in the area is linked to the rainfall gradient. In the south, the tropical rainforest receives between 2 000 and 2 500 mm of rain annually, while rainfall in the mixed deciduous forest in the north reaches between 1 500 and 2 000 mm per year. The dry season runs from December to February.

Although they are home to transitional species between Upper and Lower Guinea, the transitional forests of the Cross-Niger have a low level of endemism. The distribution of plant formations, their rainfall and species assemblages are very similar to those of the forests of the Nigerian lowlands. The evergreen forest is characterised by the presence of Fabaceae, for example *Brachystegia* spp., okan (*Cylicodiscus gabunensis*), white tola (*Pioria balsamifera*) and dabema (*Piptadeniastrum africanum*); and Meliaceae, with many species exploited for their wood, like mahogany (*Khaya ivorensis*), dibetou (*Lovoa trichilioides*),

Aerial view of the tropical forest canopy on the southern coast of Bioko Island, Equatorial Guinea. (Bluegreen Pictures / Alamy Stock Photo)

Entandrophragma spp. and *Guarea* spp. The mixed deciduous forest is rich in Malvaceae, for example *Cola* spp., African walnut (*Mansonia altissima*); Moraceae (*Antiaris africana and Ficus* spp.); and Ulmaceae, like kekele (*Holoptelea grandis*) and *Celtis* spp. However, the forest has now been reduced to scattered fragments within a vast agricultural matrix.

Endemism is also low in terms of fauna. Only three near-endemic vertebrates have been recorded in the ecoregion: the endangered Sclater's monkey (*Cercopithecus sclateri*), crested chameleon (*Trioceros cristatus*), and Anambra waxbill (*Estrilda poliopareia*). Sclater's monkey is one of the few animal species to survive hunting pressure, due to its sacred nature and the traditional protection of the sacred woods it inhabits.

CROSS-SANAGA-BIOKO COASTAL FORESTS

The Cross-Sanaga-Bioko coastal forests encompass the lowland and coastal forests of southeast Nigeria, southwest Cameroon and the island of Bioko. Only the Nigerian part is in West Africa. They extend over 52 180 km², from the Cross River (western boundary, in Nigeria) to the Sanaga River (eastern boundary, in Cameroon) over a width of around 300 km. The ecoregion is limited to an altitude of 800 m on Mount Cameroon and 900 m on Mount Bioko. The relief is relatively flat in the west and east, but much more marked in the centre.

Observed rainfall in these coastal forests is the highest in Africa, with annual averages in excess of 10 000 mm to the southwest of Mount Cameroon and the southwest of Bioko. In the lowland areas, rainfall is 3 000 mm per year on the coast, and around 2 000 mm per year inland. Annual minimum temperatures range from 15 to 21 °C, with maximums reaching 27 to 33 °C.

The coastal forests are hygrophilous with permanently high relative humidity and fertile, and evergreen, volcanic soils. Inland, in drier areas, we find a semi-evergreen forest. The most common plant species belong to the Fabaceae (particularly the Caesalpinioideae subfamily), Annonaceae, Euphorbiaceae, Rubiaceae and Malvaceae families. This ecoregion is characterised by a particularly high level of endemism and biodiversity. *Campylospermum glomeratum* (Ochnaceae), *Deinbollia angustifolia* (Sapindaceae), *Hymenostegia bakeri* (Fabaceae), *Medusandra richardsiana* (Peridiscaceae) and *Soyauxia talbotii* (Peridiscaceae) are trees endemic to the ecoregion. Some botanical genera and families are completely endemic to the area.

Mangroves in a lagoon near Princes Town, western Ghana. (DODO Content / Shutterstock)

This ecoregion is home to many species of primate that are strictly endemic and/or highly threatened, including the Cross River gorilla (*Gorilla gorilla* ssp. *diehli*), Pennant's red colobus (*Piliocolobus pennantii*), restricted to Bioko Island, Preuss's red colobus (*Piliocolobus preussi*), the red-eared monkey (*Cercopithecus erythrotis*), the drill (*Mandrillus leucophaeus*) and the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*). Reptiles and amphibians are also represented by a very high diversity of species. Leopard (*Panthera pardus*) and the crowned eagle (*Stephanoaetus coronatus*) are the main predators (apart from humans). A population of forest elephant (*Loxodonta cyclotis*) occupies the Cross River and Korup national parks, on the border between Nigeria and Cameroon. This ecoregion is exceptionally rich in amphibians, has the highest number of butterfly species in Africa, with many endemics, and is particularly rich in vertebrates.

CENTRAL AFRICAN MANGROVES

The Central African mangroves extend from Ghana (in the northwest) to Angola (in the southeast) in localised areas, the majority of which are found along the Niger Delta coast of Nigeria. They cover a total surface area of 30 990 km². In Ghana and western Nigeria, mangroves consist of lagoon systems, isolated from the ocean for part of the year by the formation of sediment banks during the dry season. Other mangrove systems are linked to river mouths.

The climate of the Central African mangroves is differentiated between their southeastern limit, which is more temperate and drier, with an average annual rainfall of 750 mm, and the Cameroon coast, which has a humid tropical climate with rainfall of up to 6 000 mm per year.

The woody plant species that colonise the Central African mangroves are the same as those in the Guinean mangroves: red mangrove (*Rhizophora racemosa, R. mangle, R. harrisonii*), black mangrove (*Avicennia germinans*) and white mangrove (*Laguncularia racemosa*). A species of palm (*Nypa fruticans, Arecaceae*) has also been introduced into both ecosystems. It is gradually replacing the red mangrove, which has deep roots that degrade the banks and a marked colonising temperament.

The mangrove animal communities are characteristic, although they do not contain any endemic species. The African manatee (*Trichechus senegalensis*) is once again present, as are the Nile softshell turtle (*Trionyx triunguis*) and Sclater's monkey (*Cercopithecus sclateri*). Many species of migratory birds and several species of marine

Endemism characterises the natural occurrence of a species exclusively in a defined geographical region. This concept, used in biogeography, can be applied to species as well as to other taxonomic groups (such as genus or family) and can concern all kinds of living beings, animals, plants or others.

An **endemic species** thus belongs to a named territory: the chimpanzee is endemic to Africa, the pygmy hippopotamus is endemic to West Africa, and the Nimba toad is endemic to the Mount Nimba massif.

The **rate of endemism** (generally expressed as a percentage of the number of endemic species in relation to the total number of species) is an important indicator of the conservation importance of a given region. Moreover, when the rate of endemism in a region is high for one group of species (such as butterflies), this rate is generally also high for other groups of species (such as other groups of insects or plants).

turtles (the hawksbill sea turtle (*Eretmochelys imbricata*) and the green sea turtle (*Chelonia mydas*), which are in danger of extinction, the leatherback sea turtle (*Dermochelys coriacea*), whose population in the ecoregion is threatened, and the olive ridley sea turtle (*Lepidochelys olivacea*)) use the Central African mangroves as a stopover and egg-laying site for certain species. Mangroves are also a breeding ground for certain species of wetland birds, and provide seasonal spawning grounds for marine fish species.

2.2 THE BIODIVERSITY OF GUINEAN FORESTS

The Guinean forests contain exceptional biodiversity, both in terms of its richness (the high number of different species) and uniqueness, what scientists call endemism, i.e. all those species that are found nowhere else in the world.

An exceptional richness, still partially unrecognised and already threatened with extinction

We know that the Guinean forests contain more than 9 000 vascular plants (trees, shrubs and flowers). However, with the exception of a few well-known groups of species, such as birds and large mammals, it is difficult to give an exact number of species found in these forests, as new discoveries are made every year. However, it is certain that the Guinean forests are home to at least the following numbers of species: 320 mammals, 785 birds, 210 reptiles, 221 amphibians, 512 freshwater fish and 156 dragonflies. It is virtually impossible to count insects, but Liberia alone has more than 800 species of butterfly.

While new species are regularly discovered, many of them are in sharp decline and, unfortunately, a growing number are on the brink of extinction. It is therefore important to learn more about the richness of the Guinean forests and to document it, in order to alert all decision-makers and encourage them to take the necessary measures to save the last forests and the biodiversity they contain.

This section gives a brief overview of this richness.

MAMMALS

More than 320 species of mammal have been recorded in the Guinean forests, ranging from forest elephants weighing up to 6 tonnes to shrews weighing less than 10 grams.

THE FOREST ELEPHANT

The African forest elephant (*Loxodonta cyclotis*) is the cousin of the African savannah elephant (*Loxodonta africana*) and the Asian elephant (*Elephas maximus*). It is smaller than the savannah elephant, with shorter, straighter tusks due to an adaptation to the forest environment where it is more difficult to move through dense undergrowth. It is generally found in the dense forests of Central and West Africa, but is also sometimes found on the edge of forest territory, like the savannah elephant, with which it can hybridise and have viable, healthy offspring.

The African forest elephant helps to maintain the composition and structure of the Guinean forests of West Africa.

This species is very dependent on the forest (and in particular the fruits of forest trees) for its food. As a mega-herbivore, it consumes a large number of plants and fruits. The African forest elephant eats more than 200 kg of plants a day to meet its needs. It contributes to the regeneration of many species by dispersing swallowed seeds over very long distances. Some plant and tree seeds only germinate after passing through the digestive tract. Elephant dung also provides a nutrient-rich environment for the growth of seedlings and is a veritable restaurant for many insects, including butterflies that come here in search of mineral salts.

Also, by creating tracks and openings in the canopy as it moves through the forest, the forest elephant creates or maintains corridors used by other species and favours slow-growing trees (typically hardwood and shade-tolerant species). It also maintains forest clearings (known as salines or baï) where it benefits from the large quantity of mineral salts available.

THE FOREST ELEPHANT

Class:	Mammals
Order:	Proboscides
Family:	Elephantidae
Genus:	*Loxodonta*
Species:	*cyclotis*
Weight:	Between 2 and 6 tonnes
Dimensions:	1.5 to 3.5 m high and 4 to 7 m long
Diet:	Mega-herbivore, consuming a large number of plants with a very varied diet (fruit, leaves, bark, herbaceous plants).
Social life:	Very social animal, but lives in small groups, travelling long distances and therefore needing large territories to survive.
Life expectancy:	Varies between 60 and 70 years.
Reproduction:	Reproductive functions appear from the age of 9 in female elephants. Male elephants reproduce at around 30 years of age. Gestation is the longest of all land mammals: 20 to 22 months. In most cases, only one elephant is carried. Females give birth to their first calf at around 23 years of age (unlike savannah elephants, which do so between 11 and 14 years).

Forest elephants in Cross River National Park (Okwangwo Division), Nigeria (© WCS; image taken by a camera trap)

Pygmy hippopotamus in Taï National Park, Côte d'Ivoire. (© B. Schweinhart / Tremarctos Photography)

THE PYGMY HIPPOPOTAMUS

The pygmy hippopotamus (*Choeropsis liberiensis*) is endemic to the forests of Guinea. It is the cousin of the common hippopotamus, which is much better known and imposing.

Its scientific name, meaning 'from Liberia', reflects the area where the vast majority of individuals can be found. Smaller populations are also often concentrated near the Liberian border, in Côte d'Ivoire, Guinea and Sierra Leone, making it a species emblematic of the region. Although there are records of this species in Nigeria, it is widely believed that that population is now extinct, with the last sightings dating back to 1942.

Some peculiarities

The skin of the pygmy hippopotamus secretes a substance that protects them and gives their bodies a pinkish tinge, sometimes called 'blood sweat', although this secretion is neither sweat nor blood.

Pygmy hippopotamuses spend most of the day hiding in streams, emerging at dusk to feed. They use pre-existing trails to travel through the dense forest.

As it is very difficult to observe this species, which is discreet and mainly nocturnal, scientists study it by exploiting its tracks and using photographic traps.

THE PYGMY HIPPOPOTAMUS

Class:	Mammals
Order:	Artiodactyles
Family:	Hippopotamidae
Genus:	*Choeropsis*
Species:	*liberiensis*
Weight:	Around 200 kg; an adult male can reach 275 kg.
Dimensions:	80 cm high and 1.7 m long. Males and females are the same height.
Diet:	Essentially different types of vegetation, such as ***Leptasis, Andropogon, Hyparrhenhia*** and ***Imperata***.
Habitat:	Wetlands and rivers in the dense rainforests of West Africa. They feed along watercourses or in natural clearings.
Life expectancy:	This varies from 30 to 55 years in captivity.
Reproduction:	The pygmy hippopotamus reaches sexual maturity at between 3 and 5 years. The gestation period varies from 190 to 210 days, and there is usually only 1 young per litter.

PRIMATES OF THE GUINEAN FORESTS

Primates occupy a special place in every culture as a group of mammals, not least because of their biological proximity to humans. As a result, they are excellent 'ambassadors' for conservation programmes.

West Africa and the island of Bioko are home to 42 species of primate, 7 of which live in savannahs or dry forests and 35 of which are dependent on forests. Of these forest species, no fewer than 21 are strictly endemic to Guinean forests.

Table 1 lists the primate species found in Guinean forests and their distribution. Species in bold are endemic to Guinean forests.

TABLE 1 Primates of the Guinean forests of West Africa

Scientific name	Common name	Endemism	Distribution
Galagidae			
Galagoides demidoff	Demidoff's galago		Forests of Africa
Galagoides thomasi	Thomas's galago		Forests of Africa
Euoticus pallidus	**Pallid galago**	**LG**	S.E. Nigeria to SW Cameroon
Sciurocheirus cameronensis	**Allen's squirrel galago**	**LG**	S.E. Nigeria to SW Cameroon
Lorisidae			
Arctocebus calabarensis	**Calabar angwantibo (potto)**	**LG**	S.E. Nigeria to SW Cameroon
Perodicticus potto	Common potto		Senegal to Ghana & Kenya
Perodicticus edwardsi	Milne-Edwards' potto		Nigeria & Central Africa
Cercopithecidae			
Cercocebus atys	**Sooty mangabey**	**UG**	Senegal to W. Côte d'Ivoire
Cercocebus lunulatus	**White-naped mangabey**	**UG**	Côte d'Ivoire to Ghana
Cercocebus torquatus	Red-capped mangabey		W. Nigeria to S. Gabon
Mandrillus leucophaeus	**Drill**	**LG**	S.E. Nigeria to S.W. Cameroon
Allochrocebus preussi	**Preuss' monkey**	**LG**	S.E. Nigeria to S.W. Cameroon
Cercopithecus diana	**Diana monkey**	**UG**	S. Guinea to W. Côte d'Ivoire
Cercopithecus roloway	**Roloway monkey**	**UG**	S. Côte d'Ivoire to E. Ghana
Cercopithecus campbelli	Campbell's monkey	NE	S. Senegal to E. Liberia

The taxonomy used follows the Handbook of the Mammals of the World, vol. 3, Primates, Lynx Editions, 2013. Endemism: UG = Upper Guinea; LG = Lower Guinea; GF = Guinean forests; NE = near-endemic.

TABLE 1 continued...

Scientific name	Common name	Endemism	Distribution
Cercopithecus mona	**Mona monkey**	**LG**	S.E. Ghana to S.W. Cameroon
Cercopithecus lowei	**Lowe's monkey**	**UG**	W. Côte d'Ivoire to Ghana
Cercopithecus pogonias	Crowned monkey		S.E. Nigeria to N.C. DRC
Cercopithecus petaurista	Spot-nosed monkey	NE	S. Senegal to Togo
Cercopithecus erythrogaster	**Red-bellied monkey**	**LG**	S.E. Togo to S Nigeria
Cercopithecus sclateri	**Sclater's monkey**	**LG**	S.E. Nigeria
Cercopithecus erythrotis	**Red-eared monkey**	**LG**	S.E. Nigeria to S.W. Cameroon
Cercopithecus nictitans	Putty-nosed monkey		N. Liberia to Central Africa
Procolobus verus	**Olive colobus**	**GF**	S.E. Sierra Leone to S.E. Nigeria
Piliocolobus badius	**Western red colobus**	**UG**	Sierra Leone to W. Côte d'Ivoire
Piliocolobus waldroni	**Miss Waldron's red colobus**	**UG**	E. Côte d'Ivoire to W. Ghana
Piliocolobus epieni	**Niger Delta red colobus**	**LG**	S. Nigeria
Piliocolobus preussi	**Preuss's red colobus**	**LG**	S.E. Nigeria to S.W. Cameroon
Piliocolobus pennantii	**Pennant's red colobus**	**LG**	Bioko island
Colobus polykomos	King colobus	NE	S. Senegal to W. Côte d'Ivoire
Colobus vellerosus	**Geoffroy's (white-thighed) colobus**	**GF**	C. Côte d'Ivoire to W. Nigeria
Colobus satanas	Black colobus		Bioko island to W. Central Africa
Colobus guereza	Guereza colobus		E. Nigeria to East Africa
Hominidae			
Gorilla gorilla	Western gorilla		E. Nigeria to Congo
Pan troglodytes	Common chimpanzee		S. Senegal to Uganda
Other primates of West Africa (but living in savannahs)			
Galagidae			
Galago senegalensis	Senegal Galago		
Cercopithecidae			
Papio papio	Guinea Baboon		
Papio anubis	Olive Baboon		
Erythrocebus patas	Patas Monkey		
Chlorocebus sabaeus	Green Monkey		
Chlorocebus tantalus	Tantalus Monkey		
Piliocolobus temminckii	Temminck's red colobus		

*A family of West African chimpanzees (*Pan troglodytes verus*), Guinea. (© WCF)*

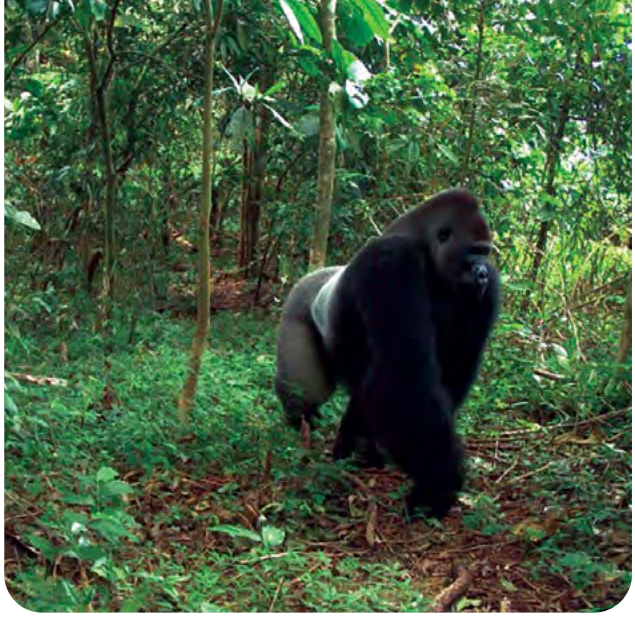
THE CHIMPANZEE

The chimpanzee (*Pan troglodytes*) is an important target for conservation. Of the four subspecies of chimpanzee in the world, only one is endemic to the forests of Upper Guinea (*Pan troglodytes verus*, the West African chimpanzee) and another to the forests of Lower Guinea (*Pan troglodytes ellioti*, the Nigeria-Cameroon chimpanzee).

The chimpanzee lives mainly in forests, but can also be found in wooded savannahs. Unfortunately, these habitats are increasingly threatened by the expansion of both village and industrial agriculture. What is more, although protected, this species is hunted either for its meat or for the trade in live individuals to be sold as 'pets'. There are thought to be only 200 000 to 300 000 chimpanzees remaining in the world (taking into account the four subspecies), and this number has been steadily declining for several decades, particularly in West Africa, where deforestation is at its greatest on the African continent. The species is considered endangered by the International Union for the Conservation of Nature (IUCN).

THE CHIMPANZEE

Class:	Mammals
Order:	Primates
Family:	Hominidae
Genus:	*Pan*
Species:	*troglodytes*
Weight:	Between 30 and 40 kg for females and from 40 to 60 kg for males.
Dimensions :	Up to 1.7 m standing.
Diet:	Omnivorous, but mainly frugivorous. The chimpanzee also eats leaves and bark, as well as insects and small vertebrates, and very occasionally small monkeys and duikers.
Social life:	A highly social animal, forming groups of 15 to 100 individuals. Males are often aggressive towards other groups, and may kill other 'foreign' individuals. Their territories vary from 5 to 12 km².
Life expectancy:	Around 20 years. In natural conditions, certain chimpanzees can live 30-35 years.
Reproduction:	Chimpanzees reach puberty at around 7-8 years of age, but females generally give birth to their first young (rarely twins) at around 13-14 years of age, after a gestation period of 230 days.



*A rare photo of a Cross River gorilla (*Gorilla gorilla diehli*), taken by a camera trap. (© WCS)*

THE CROSS RIVER GORILLA

There are two species of gorillas in Africa. The eastern gorilla is found in the east of the Republic of Congo, Rwanda and Uganda, while the western gorilla is widespread from southeast Nigeria to the west of the Congo Basin. The latter species is itself made up of two distinct subspecies, the rarest and least widespread of which is the Cross River gorilla (*Gorilla gorilla diehli*), found only in southeast Nigeria and southwest Cameroon.

The Cross River gorilla is one of the rarest mammals in the world, with a total population of less than 300 individuals. Moreover, this species is distributed in small, isolated populations, some of which are found in conflict zones in Cameroon. Throughout its distribution area, deforestation and illegal hunting are major threats.

This great ape is found in a number of protected areas, including Cross River National Park, which receives technical and financial support from the Wildlife Conservation Society (WCS), notably through the PAPFor programme and USAID.

Given the alarming nature of the Cross River gorilla's conservation situation, it is classified as critically endangered by the IUCN.

THE CROSS RIVER GORILLA

Class:	Mammals
Order:	Primates
Family:	Hominidae
Genus:	*Gorilla*
Species:	*gorilla diehli*
Weight:	Between 60 and 75 kg for females and from 150 to 190 kg for males.
Dimensions :	Up to 1.8 m standing.
Diet:	Fruit is the preferred food, but the gorilla also eats herbaceous plants; zingiberaceae and marantaceae are highly prized. Ants and termites are occasionally eaten.
Social life:	A social animal, it forms small groups with a dominant male and typically 3-7 adult females.
Life expectancy:	Unknown
Reproduction :	Females generally give birth to their first young at around 10-11 years of age, after a gestation period of 250 days. Reproduction is slow, with an interval of at least 4 years between births to the same female.

*The Diana monkey (*Cercopithecus diana*), a typical representative of this group of monkeys. (© M. Languy)*

*The western red colobus (*Piliocolobus badius*) exists only in the forests that stretch from Sierra Leone to the west of Côte d'Ivoire. (© M. Languy)*

OTHER PRIMATES...

Among the species that live mainly in the canopy, various cercopithecines and colobuses populate the Guinean forests of West Africa.

Many species have evolved in isolation within various watersheds, and recent research shows that many groups, previously thought to be subspecies of a widespread species, are in fact distinct species in their own right.

One of the most diverse groups is the cercopithecines, which are small monkeys living almost exclusively in the canopy. Several species require an uninterrupted canopy, making these monkeys highly vulnerable to any form of logging. The Guinean forests constitute the forest block with the highest rate of endemism. More than a dozen species (or subspecies, depending on the taxonomy used) are found only in the dense rainforests of West Africa.

Sixteen species of colobuses (genus *Procolobus, Piliocolobus* and *Colobus*) have been recorded in Africa, the majority of which are found in the Guinean forests. These medium-sized monkeys have specialised their diet, preferring the leaves, petioles and unripe fruit of leguminous trees (Fabaceae), leaving the ripe, coloured fruit to other monkey species. Some species have very limited distributions. Among them, Miss Waldron's red colobus (*Piliocolobus waldroni*) is considered extinct, although it was once fairly common in eastern Côte d'Ivoire and Ghana.

→

*A Johnston's genet (*Genetta johnstoni*), photographed in the Taï National Park, Côte d'Ivoire. (© F. et S. Pekus)*

THE CARNIVORES OF THE GUINEAN FORESTS

From a taxonomic point of view (the classification of species), the term 'carnivore' corresponds to an order within the class of mammals, which includes canids, felids, genets, mustelids and a few other related families.

There are 29 carnivore species found in Guinean forests, of which around half are typically forest-dwelling; the others are adapted to both forest and savannah environments (Table 2). Species in bold are endemic to Guinean forests.

Some of these species have very restricted distributions, such as the Liberian mongoose (*Liberiictis kuhni*), which is the only species in the Liberiictis genus. This small carnivore is only found between the Saint John River, in eastern Liberia, and the Sassandra River, in western Côte d'Ivoire, where it prefers the banks of rivers and undergrowth, which are abundant in the earthworms that form the majority of its diet. Given its restricted distribution and the threats to primary forests, this species is considered threatened by the IUCN.

The biggest predator in the Guinean forests is the leopard (or panther, *Panthera pardus*). It can be found in most of the large protected areas in the Guinean forests, but always at low densities, as its survival depends on the abundance of its prey, which is heavily hunted by humans. The leopard itself, although protected by law, is unfortunately still persecuted for its fur. Other felines are also present in low densities but are rarely seen, their presence being generally confirmed by photographic traps as part of research or biomonitoring programmes.

Due to their position at the top of the food chain, carnivores are very good indicators of the health of forests and their monitoring is an important element of conservation programmes.

TABLE 2 Carnivores of the Guinean forests

Scientific name	Common name	Endemism	Range
Nandiniidae			
Nandinia binotata	African palm civet		African tropical forests
Felidae			
Panthera pardus	Leopard		Pan-African
Leptailurus serval	Serval		Africa, except dense forests
Profelis aurata celidogaster	African golden cat		African tropical forests
Felis silvestris	Wildcat		Pan-African
Viverridae			
Civettictis civetta	African civet		Sub-Sahara
Poiana leightoni	**Leighton's oyan**	**UG**	Liberia and Côte d'Ivoire
Poiana richardsonii	Central African oyan		Central Africa incl. W. Cameroon
Genetta bourloni	**Bourlon's genet**	**UG**	Forest from Guinea to Côte d'Ivoire
Genetta cristata	**Crested genet**	**LG**	S.E. Nigeria and S.W. Cameroon
Genetta johnstoni	**Johnston's genet**	**UG**	Forest from Guinea to Ghana
Genetta maculata	Rusty-spotted genet		Sub-Saharan Africa east of Ghana
Genetta pardina	Pardine genet		From Senegal to Ghana
Genetta poensis	King genet		Coastal forests from Liberia to Congo
Genetta thierryi	Hausa genet		From Senegal to Cameroon
Herpestidae			
Atilax paludinosus	Marsh mongoose		Sub-Sahara
Xenogale naso	Long-nose mongoose		S.E. Nigeria and Central Africa
Herpestes ichneumon	Egyptian mongoose		Pan-African
Galerella sanguinea	Common slender mongoose		Pan-African
Ichneumia albicauda	White-tailed mongoose		Pan-African, avoids dense forests
Bdeogale nigripes	Black-footed mongoose		S.E. Nigeria and Central Africa
Crossarchus obscurus	**Common cusimanse**	**UG**	Forest from Guinea to Ghana
Crossarchus platycephalus	Flat-headed cusimanse		From Benin to Western Central Africa
Liberiictis kuhni	**Liberian mongoose**	**UG**	Liberia and Côte d'Ivoire
Mungos gambianus	Gambian mongoose		From Senegal to Nigeria
Mustelidae			
Mellivora capensis	Honey badger		Pan-African and Asia
Hydrictis maculicollis	Spotted-necked otter		Sub-Sahara
Aonyx capensis	African clawless otter		Sub-Sahara

The taxonomy used follows the Handbook of the Mammals of the World, vol. 1, Carnivores, Lynx Editions, 2009. Endemism: UG = Upper Guinea; LG = Lower Guinea.

*White-bellied pangolin (*Phataginus tricuspis*), Sapo National Park. (© M. Languy)*

*Long-tailed pangolin (*Uromanis tetradactyla*), Montserrado County, Liberia. (© M. Languy)*

THE PANGOLINS OF GUINEAN FORESTS

Pangolins are exceptional mammals in many ways. Their strangest and best-known feature is that they are covered mainly in scales and not hair, except on their bellies. This allows them to curl up into a ball when they feel threatened and escape the fangs of their predators. The name 'pangolin' comes from the Malay language and means 'one who curls up into a ball'. A second characteristic is that they feed almost exclusively on ants and termites. They do not have teeth, but do have an extremely long tongue, which, when unrolled, is as long as their body.

Four species of pangolins exist in Africa, three of which live in the forests of Guinea: the long-tailed pangolin (*Uromanis tetradactyla*), white-bellied pangolin (*Phataginus tricuspis*) and giant ground pangolin (*Smutsia gigantea*).

Due to the long-tailed pangolin living in areas that are difficult to access and infested with stinging ants, and because it is small and shy, this arboreal species is slightly less threatened than the other more terrestrial species; it is nevertheless considered vulnerable. The other two West African species are critically endangered due to local trade in their meat and international trade in their scales, which are sold mainly in China for traditional medicine. Several hundred thousand pangolins are killed every year in Africa. In 2021, for example, China confiscated a stock of 23 tonnes of pangolin scales originating from Nigeria.

Given that hunting pressures are lesser in protected areas, these play an essential role in the survival of West African pangolins.

THE LONG-TAILED PANGOLIN

Class:	Mammals
Order:	Pholidotes
Family:	Manidae
Genus:	*Uromanis*
Species:	*tetradactyla*
Weight:	Between 2.2 and 3.6 kg
Dimensions:	From 30 to 35 cm without its tail; the tail is 55 to 80 cm.
Diet:	Tree ants (*Crematogaster* and *Cataulacus* in particular).
Habitat:	Very often near forest rivers or swamps.
Life expectancy:	Unknown
Reproduction:	Births can take place all year long as females can become fertile as soon as two weeks after giving birth. A single young is born in a tree hole.
Adaptation:	This species has a particularly long tail that allows it to maintain balance while climbing trees, though it is mainly used to cling to branches.

*Jentink's Duiker (*Cephalophus jentinki*), represented here on a stamp, is a point of national pride in Côte d'Ivoire.*

TABLE 3 Duikers of the Guinean forests

Scientific name	Common name	Endemism
Philantomba monticola	Blue duiker	
Philantomba maxwelli	Maxwell's duiker	
Philantomba walteri	Walter's duiker	
Cephalophus zebra	**Zebra duiker**	**UG**
Cephalophus brookei	**Brooke's duiker**	**UG**
Cephalophus niger	**Black duiker**	**UG**
Cephalophus silvicultor	Yellow-backed duiker	
Cephalophus dorsalis	Bay duiker	
Cephalophus jentinki	**Jentink's duiker**	**UG**

The taxonomy used follows The Kingdon field guide to African Mammals, 2nd edition, Bloomsbury, 2015. Endemism: UG = Upper Guinea. Bold type = endemic to the Guinean forests.

AND MANY OTHER MAMMAL SPECIES...

Among the other mammals typically found in Guinean forests are **duikers**, a sort of small, forest-dwelling antelope from the Bovidae family. Guinean forests are home to no less than nine species, four of which are endemic (Table 3).

The blue and Maxwell's duiker are the smallest species, an adult female rarely reaching more than 5 or 6 kg. The largest are the yellow-backed and Jentink's duiker, the male often reaching 80 kg.

Certain duiker are emblematic of their unique appearance. Both the zebra and Jentink's duikers attract a particular interest. They both have more or less the same distribution: from the east of Sierra Leone to the west of Côte d'Ivoire.

Duikers are an essential link in the ecological chain of Guinean forests: on the one hand, they are prey for large predators such as leopard; and on the other, they control the composition of undergrowth by eating vegetation, including young plant shoots. They are also important disseminators of trees by eating fallen fruit.

All duikers are hunted for their meat, and many species have virtually disappeared outside protected areas. For example, less than 2 500 Brooke's duikers, considered to be in danger of extinction, remain. The Sapo, Grebo-Krahn and Taï National Parks are important refuges for this species. Similarly, zebra and Jentink's duikers are threatened and their survival depends largely on conservation programmes in the Gola-Foya, WWZ and TGKS landscapes, which correspond almost perfectly to their distribution.

*Zebra duiker (*Cephalophus zebra*). (imageBROKER. com GmbH & Co. KG / Alamy Stock Photo)*

*Maxwell's duiker (*Cephalophus maxwelli*), Taï National Park, Côte d'Ivoire. (© B. Scheinhart, Tremarctos Photography)*

JENTINK'S DUIKER

Class :	Mammifères
Order :	Cétartiodactyles
Family :	Bovidae
Genus:	*Cephalophus*
Species :	*jentinki*
Weight:	Between 55 and 80 kg, which makes it one of the largest duikers in Africa.
Dimensions:	75-85 cm high.
Diet:	Mainly young shoots from undergrowth shrubs, but also fruit that has fallen to the ground. It has very strong jaws, enabling it to eat nuts.
Habitat:	Mainly dense forests with closed canopies, but also natural clearings and adjacent heavily wooded agricultural areas. It needs numerous fruit-bearing trees and dense undergrowth for shelter.
Life expectancy:	Unknown in the wild; 21 years in captivity.
Reproduction:	Very little understood; generally one offspring at a time.
Social life:	No known social behaviour; most observations are of isolated individuals, sometimes couples. It is sedentary and territorial.

Guinean forests are also rich in **rodents**. Apart from mice, field mice and rats, a particularly well-represented group are squirrels (Sciuridae), with around 15 species, two of which are endemic to the forests of Upper Guinea: the small sun squirrel (*Heliosciurus punctatus*) and the slender-tailed squirrel (*Allosciurus aubinnii*); while another is endemic to the forests of Lower Guinea: Cooper's mountain squirrel (*Paraxerus cooperi*) (Table 4). The slender-tailed squirrel is a rare and uncommon squirrel, of which only a few photographs exist. Its distribution is limited to Liberia and Ghana where it is often associated with palm trees, the source of a favourite nut.

Anomalures (Anomaluridae) are a family closely related to squirrels and are commonly referred to as flying squirrels because, although unable to fly, they can glide from tree to tree thanks to membranes along their bodies. Unlike squirrels, anomalures are nocturnal animals. Of the four species of anomalure found in Guinean forests, one is endemic to Upper Guinea: Pel's anomalure (*Anomalurus peli*), which is also the largest species.

*The small sun squirrel (*Heliosciurus punctatus*). (© M. Languy)*

TABLE 4 Squirrels (Sciuridae) and anomalures (Anomaluridae) of Guinean forests

Scientific name	Common name	Endemism
Sciuridae		
Xerus erythropus	Striped ground squirrel	
Myosciurus pumilio	African pygmy squirrel	
Heliosciurus gambianus	Gambian sun squirrel	
Heliosciurus punctatus	**Small sun squirrel**	**UG**
Heliosciurus rufobrachium	Red-legged sun squirrel	
Protoxerus stangeri	Forest giant squirrel	
Allosciurus aubinnii	**Slender-tailed squirrel**	**UG**
Epixerus ebii	Western palm squirrel	
Funisciurus pyrropus	Fire-footed rope squirrel	
Funisciurus leucogenys	Red-cheeked rope squirrel	
Funisciurus anerythrus	Thomas' rope squirrel	
Funisciurus isabella	Lady Burton's rope squirrel	
Paraxerus poensis	Green bush squirrel	
Paraxerus cooperi	**Cooper's mountain squirrel**	**LG**
Anomaluridae		
Anomalurus beecrofti	Beecroft's anomalure	
Anomalurus peli	**Pel's anomalure**	**UG**
Anomalurus derbianus	Lord Derby's anomalure	
Idiurus macrotis	Long-eared anomalure	

The taxonomy used follows The Kingdon field guide to African Mammals, 2nd edition, Bloomsbury, 2015.
Endemism: UG = Upper Guinea; LG = Lower Guinea.

A bat in Mount Nimba, Liberia. (© M. Languy)

*The slender-tailed squirrel (*Allosciurus aubinnii*), East Nimba Nature Reserve. © M. Languy.*

*The Nimba Mountain bat (*Myotis nimbaensis*). © Bat Conservation International.*

Bats are another important group of mammals because of their ecology: insectivores regulate insect species, frugivores play an important role in seed dispersal and nectarivores facilitate pollination.

The Nimba Mountains are world-famous for their rich diversity of bats. In particular, Lamotte's roundleaf bat (*Hipposideros lamottei*) is endemic to these mountains and is critically endangered. Even more surprising is the very recent discovery of a new species, also endemic to the Nimba Mountains, the Nimba Mountain bat (*Myotis nimbaensis*), which was only first described in 2021.

BIRDS

There are almost 1 000 species of birds in the forest and peri-forest zones of West Africa, almost half of all the species recorded in sub-Saharan Africa. Guinea's forests therefore represent a major reservoir of avian diversity. This high number of species includes mainly breeding species, but also some migratory species that find refuge in West Africa for a few months each year, escaping either the winter in Europe or the dry season in other African regions.

In addition to this richness, these forests contain unique species. In fact, not counting the 20 or so mountain species that are strictly confined to the island of Bioko and the border zone between Cameroon and Nigeria, 35 bird species that are strictly endemic to the Guinean forests have been counted, plus 10 species that are virtually endemic due to their distribution extending into Senegal and/or because they also live in the peripheral zone of the dense rainforest (Tables 5 and 6).

TABLE 5 Birds endemic to Guinean forests

Scientific name	Common name	Endemism
Numididae		
Agelastes meleagrides	White-breasted guineafowl	UG
Phasianidae		
Pternistis ahantensis	Ahanta francolin	NE
Psittacidae		
Psittacus timneh	Timneh parrot	UG
Cuculidae		
Cercococcyx lemaireae	Whistling long-tailed cuckoo	GF
Strigidae		
Scotopelia ussheri	Rufous fishing owl	UG
Meropidae		
Merops mentalis	Blue-moustached bee-eater	GF
Bucerotidae		
Horizocerus albocristatus	Western long-tailed hornbill	NE
Lophoceros semifasciatus	West African pied hornbill	GF
Bycanistes cylindricus	Brown-cheeked hornbill	UG
Ceratogymna elata	Yellow-casqued wattled hornbill	NE
Capitonidae		
Buccanodon dowsetti	Western yellow-spotted barbet	UG
Trachylaemus goffinni	Western yellow-billed barbet	UG
Trachylaemus togoensis	Togo yellow-billed barbet	UG
Indicatoridae		
Melignomon eisentrauti	Yellow-footed honeyguide	GF
Picidae		
Campethera maculosa	Little green woodpecker	NE

The taxonomy follows BirdLife International and Handbook of the Birds of the World BirdLife International, BirdLife International digital checklist of the birds of the world, version 5, 2020. Endemism: GF = Guinean Forests; UG = Upper Guinea; NE = near-endemic.

TABLE 5 continued...

Nom scientifique	Nom commun	Endémisme
Dendropicos lugubris	Melancholy woodpecker	UG
Chloropicus pyrrhogaster	Fire-bellied woodpecker	GF
Campephagidae		
Lobotos lobatus	Western wattled cuckooshrike	UG
Pycnonotidae		
Phyllastrephus baumanni	Baumann's greenbul	NE
Bleda eximius	Green-tailed bristlebill	UG
Bleda canicapillus	Grey-headed bristlebill	NE
Criniger olivaceus	Yellow-bearded greenbul	UG
Criniger barbatus	Western bearded greenbul	GF
Turdidae		
Stizorhina finschii	Finsch's flycatcher thrush	GF
Alethe diademata	White-tailed alethe	NE
Cisticolidae		
Apalis sharpii	Sharpe's apalis	UG
Bathmocercus cerviniventris	Black-headed rufous warbler	UG
Macrosphenidae		
Macrosphenus kempi	Kemp's longbill	GF
Muscicapidae		
Melaenornis annamarulae	Nimba flycatcher	NE
Muscicapa ussheri	Ussher's flycatcher	NE
Platysteiridae		
Dyaphorophyia hormophora	West African wattle-eye	UG
Dyaphorophyia blissetti	Red-cheeked wattle-eye	GF
Dyaphorophyia concreta	Rufous-bellied wattle-eye	UG
Timaliidae		
Illadopsis rufescens	Rufous-winged illadopsis	UG
Picathartidae		
Picathartes gymnocephalus	Yellow-headed picathartes	UG
Nectariniidae		
Chalcomitra adelberti	Buff-throated sunbird	GF
Prionopidae		
Prionops caniceps	Red-billed helmetshrike	GF
Dicruridae		
Dicrurus atactus	Velvet-mantled drongo	UG
Sturnidae		
Hylopsar cupreocauda	Copper-tailed glossy starling	UG
Ploceidae		
Malimbus ballmanni	Gola malimbe	UG
Malimbus scutatus	Red-vented malimbe	GF
Ploceus brachypterus	Swainson's weaver	GF
Ploceus castaneofuscus	Chestnut-and-black weaver	GF
Estrildidae		
Parmoptila rubrifrons	Red-fronted antpecker	UG
Pyrenestes sanguineus	Crimson seedcracker	NE

*The yellow-headed picathartes (*Picathartes gymnocephalus*), Ghana. (© N. Borrow)*

Some of these species are emblematic and have cultural or tourism value, such as the yellow-headed picathartes (*Picathartes gymnocephalus*).

This bird is exceptional in many ways. Together with its Central African cousin, the Cameroon picathartes, they are the only two members of the Picathartidae family in the world. The yellow-headed picathartes is found only in certain dense forests, from Guinea to Ghana. It has a very distinctive appearance, giving the impression of having come from the time of the dinosaurs.

Despite its bright colours, it is rarely seen, as it silently scours the dense forest floor in search of insects, small amphibians or any other small animal within its reach. The best time to observe a picathartes is at the end of the day when it joins its fellow birds in the roost, which also serves as their nesting site. Here too, this species is unique: it requires large rocks with overhangs to build mud nests on the rock face, in the manner of certain swallows.

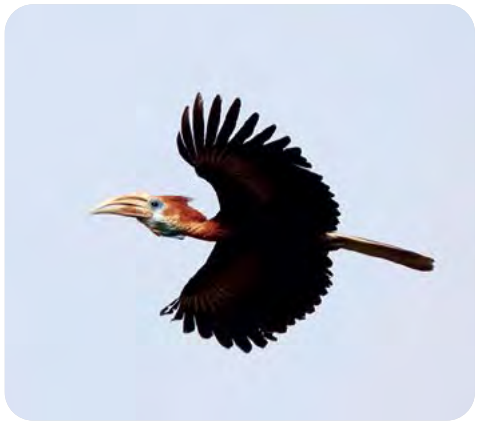
Unfortunately, the yellow-headed picathartes is threatened with extinction and is classified as vulnerable by the IUCN. This species has highly fragmented populations that are increasingly isolated from one another, and with deforestation and its very specific nesting requirements, the picathartes' habitat is shrinking year by year. Also, it is regularly hunted, either caught in snare traps or when the large young are preyed upon in the nest.

Fortunately, it populates several protected areas, offering an opportunity for tourism. The yellow-headed picathartes is very popular with birdwatchers, who are prepared to travel thousands of kilometres for the chance to see this emblematic species of the Upper Guinean forests, representing a real opportunity to reconcile conservation with the development of communities living alongside protected areas.

YELLOW-HEADED PICATHARTES

Class:	Birds
Order:	Passerine
Family:	Picathartidae
Genus:	*Picathartes*
Species:	*gymnocephalus*
Weight:	around 200 gm
Dimensions :	40 cm
Diet:	Essentially insects, but also millipedes, small lizards, frogs and other small vertebrates.
Habitat:	Dense forests, but also degraded forests so long as rocky outcrops are present and they are not disturbed.
Life expectancy:	Unknown
Reproduction:	The female generally lays two eggs (sometimes just one) in a nest made of mud on the side of large rocks. The eggs are incubated for 23 to 28 days. There are often two clutches per year.
Social life:	Often solitary, sometimes in pairs when feeding. But they do form small colonies for nesting, typically of 3 to 10 nests. Outside the breeding season, some sites are also used as roosts and the birds often arrive 30 minutes or an hour before sunset, which is the best time to observe them.

*Timneh parrot (*Psittacus timneh*) in the Tiwai Island Wildlife Sanctuary, Sierra Leone. (© M. Languy)*



*A female yellow-casqued hornbill (*Ceratogymna elata*), East Nimba Nature Reserve, Liberia. (© M. Languy)*

Other emblematic species of the Guinean forests include the Timneh parrot (*Psittacus timneh*), a cousin of the Gabon parrot but rarer; it is on the IUCN's Red List of species in danger of extinction and is only found in forests from Guinea to Côte d'Ivoire.

Hornbills (Bucerotidae family) are a group of large birds that play a key role in Guinean forests: as fruit eaters they are great dispersers of tree seeds. There are 10 species of hornbills in the forests of West Africa, four of which are endemic: the western long-tailed hornbill (*Horizocerus albocristatus*), the West African pied hornbill (*Lophoceros semifasciatus*), the brown-cheeked hornbill (*Bycanistes cylindricus*) and the yellow-casqued wattled hornbill (*Ceratogymna elata*).

With no fewer than 18 species, the diversity of **cuckoos** is exceptional in West Africa. Many species are very discreet, revealing their presence only through their song, which is often very typical. Such is the case of the olive long-tailed cuckoo (*Cercococcyx olivinus*), which lives exclusively in the canopy of undisturbed forests.

With more than 20 species, **bulbuls** (Pycnonotidae family) are one of the most typical groups in the forests of Central and West Africa. The vast majority are exclusively forest dwelling, and no fewer than five species are endemic, or near endemic, to Guinean forests.

*Olive long-tailed cuckoo (*Cercococcyx olivinus*) in the lowland forest of the East Nimba Nature Reserve, Liberia. (© M. Languy)*

*The Western bearded greenbul (*Criniger barbatus*). (© M. Languy)*

Sharpe's apalis (Apalis sharpii) *(male and female), Mount Nimba. (© M. Languy)*

The forests of West Africa are also a refuge for a large number of small birds, mainly insectivores, including apalis, camaroptera and eremomela, all members of the vast **cisticolidae** family.

Sharpe's apalis (*Apalis sharpii*) is a small insectivorous bird typical of the dense rainforests of West Africa, from Benin to Guinea. It is not often seen, as it prefers to live high up in the trees, but its typical song often indicates its presence.

With around 40 species, including four endemics, the group of **flycatchers** and allies (Paradise flycatchers and Pririts) is well represented. The West African wattle-eye (*Dyaphorophyia hormophora*) is a tiny black and white bird, barely 10 cm long, closely related to the flycatchers. Endemic to the Upper Guinean forests, it is found both inside and on the edge of the forests. The male can be recognised by the greyish wattles around its eyes, while the female has a hazel-brown breast.

*West African wattle-eye (*Dyaphorophyia hormophora*), East Nimba Nature Reserve, Liberia. (© M. Languy)*

The Ploceidae include **weavers, malimbes** and **euplectes**. These species are mainly granivorous and frugivores.

Within this group, the Gola malimbe (*Malimbus ballmanni*), is a forest weaver with a very restricted distribution. It is found almost exclusively in Liberia, with a few outliers in the far east of Sierra Leone, southern Guinea and western Côte d'Ivoire. But even in this restricted range, it is only found in a few well-preserved forests, such as the Gola, Sapo, Grebo-Krahn or Taï national parks. With fewer than 10 000 individuals worldwide, the species is classified as near threatened by the IUCN. The Gola malimbe has a unique plumage, being the only malimbe to sport black and yellow. Living in small groups, it very often stays in the tree canopy of large undisturbed forests, more rarely in old secondary forests, which makes it difficult to observe.

*A young Gola malimbe (*Malimbus ballmanni*), Sapo National Park, Liberia. (© M. Languy)*

REPTILES AND AMPHIBIANS

With more than 100 species of reptiles and more than 200 species of amphibians, the herpetofauna is particularly rich in the Guinean forests. As these animals are less mobile than mammals or birds, the rate of endemism is particularly high: many species have evolved in isolation, resulting in single species with a restricted distribution. This endemism is particularly high in the mountainous areas bordering Nigeria and Cameroon and in adjacent areas. A particularly important area is found in the Cross River landscape – the forests between the Cross River and Mount Cameroon – an area where high endemism is also observed for other groups of animals, such as butterflies.

Further to the west, there also exist reptiles and amphibians endemic to the forests of Upper Guinea and certain mountain ranges between Sierra Leone and Ghana.

REPTILES

The class of reptiles in the forests of West Africa is represented by various groups, including turtles, crocodiles, geckos, agamas, chameleons, skinks and lizards, monitor lizards and snakes. These groups are less well known than the mammals, and new species (mainly snakes, agamas and lizards) continue to be discovered almost every year. For example, in April 2021, during a mission funded by PAPFor in the East Nimba Nature Reserve (Liberia), an unidentified snake was observed. Several experts agree that it is probably a species new to science, close to *Boaedon olivaceus*, the olive house snake, but this can only be confirmed if a specimen is captured and studied in more detail.

Unknown snake, Boaedon cf. olivaceus*, East Nimba Nature Reserve, Liberia. (© M. Languy).*

*A young black forest cobra (*Naja guineensis*), endemic in the forests of Upper Guinea, East Nimba Nature Reserve, Liberia. (© M. Languy)*

Osteolaemus tetraspis *photographed in the Taï National Park, Côte d'Ivoire. (© Benjamin Schweinhart, Tremarctos Photography)*

A recent study established that the forest cobra living in West Africa is its own species, distinct from its counterparts in Central Africa and the Sahelian zones.

Among the crocodiles is the dwarf crocodile (*Osteolaemus tetraspis*), a species found in Upper and Lower Guinea that was sought after until the mid-1980s by certain luxury clothing and leather goods brands. The species is considered vulnerable by the IUCN.

While marine turtles are fairly well known, the various **terrestrial turtles** found in the forests of West Africa are not. The Pelomedusidae family includes a number of species that prefer waterways, such as the West African black turtle (*Pelusios niger*) and the African forest turtle (*Pelusios gabonensis*). The Côte d'Ivoire mud turtle (*Pelusios cupulatta*), meanwhile, is endemic to the aquatic areas of the forests of Upper Guinea with abundant vegetation, from Sierra Leone to Benin.

Other turtles, belonging to the Trionychidae family, also live in forested wetlands, such as Aubry's flapshell turtle (*Cycloderma aubryi*) and the African softshell turtle (*Trionyx triungus*), which are characterised by their soft shells. A final family, the Testudinidae, includes the hard-shelled *Cinixys*, which live in undergrowth and feed mainly on mushrooms.

Numerous lizards, agamas and skinks also live in the Guinean forests. The tropical mabuya (*Trachylepis paucisquamis*) is one of many species endemic to the forests of Upper Guinea. The classification of different groups is still poorly understood, and DNA-based research shows that there are probably many species yet to be described.

*Côte d'Ivoire mud turtle (*Pelusios cupulatta*) in the Taï National Park, Côte d'Ivoire. (© Benjamin Schweinhart, Tremarctos Photography)*

*Tropical mabuya (*Trachylepis paucisquamis*), Marshall (Liberia). (© M. Languy)*

AMPHIBIANS

There are no salamanders or newts in sub-Saharan Africa. Amphibians are therefore mainly represented by frogs and toads (together also known as anurans), as well as a very special group of amphibians, **the caecilians** (also known as gymnophiones), which have no legs and look a little like snakes or large earthworms. There are less than 10 species of caecilians in the Guinean forests, mainly found in southwest Cameroon, but there are also three species in Upper Guinea.

ANURANS (FROGS AND TOADS)

Anurans are a vast group of species, some of which are highly dependent on a particular habitat, resulting sometimes in very restricted distributions. Some species are known from only a few sites, or even one very small site.

With over 200 species, the Guinean forests are home to an impressive number of frogs and toads. What is even more remarkable is the large number of species endemic to these forests: 90 species, excluding several dozen species native to the highland forests of western Cameroon (Table 6). This number will undoubtedly vary over time as new research and inventories are undertaken in West Africa.

Of all **the toads** in the region, the strangest and most endangered is undoubtedly the Nimba toad (*Nimbaphrynoides occidentalis*). This tiny toad, barely 2 to 3 cm long, does not lay eggs but gives birth to live young. It is found only in the grassy meadows at high altitudes on the mountain shared by Guinea, Côte d'Ivoire and Liberia. Due to its very restricted distribution and the recurring threats to its habitat (bushfires in particular), this species is critically endangered. The entire world population of this toad is found in two protected areas: the Mount Nimba Strict Nature Reserve in Guinea and the East Nimba Nature Reserve in Liberia, both part of the Mount Nimba landscape, which is supported by the European Union and other donors.

Many species of frog and toad are extremely restricted in distribution, sometimes covering only a few hundred hectares, particularly in the mountain ranges of Cameroon. As such, it is hardly surprising that many are threatened with extinction. Protecting their habitats is often essential to preserving these highly sensitive species. Threats include climate change, bushfires, deforestation and the introduction of invasive species, as well as various diseases that can decimate entire populations.

Geotrypetes seraphini *is widespread in the forests from Sierra Leone to Congo. (© Marius Burger)*

*Nimba toad (*Nimbaphrynoides occidentalis*), Mount Nimba Strict Nature Reserve, Guinea. (© M. Languy)*

*The Liberian puddle frog (*Phrynobatrachus liberiensis*), endemic to Guinean forests, Sapo National Park, Liberia. (© M. Languy)*

TABLE 6 Amphibians endemic to Guinean forests

Scientific name	Common name	Endemism
Xenopus tropicalis	Tropical clawed frog	GF
Phlyctimantis boulengeri	Boulenger's wot-wot	GF
Hyperolius fusciventris	Dark-bellied reed frog	GF
Hyperolius concolor	Uniform reed frog	GF
Hyperolius sylvaticus	Forest reed frog	GF
Leptopelis spiritusnoctis	Ghostly tree frog	GF
Arthroleptis poecilonotus	Mottled squeaker	GF
Arthroleptis brevipes	Short-legged squeaker	GF
Phrynobatrachus liberiensis	Liberian puddle frog	GF
Phrynobatrachus plicatus	Ridged puddle frog	GF
Phrynobatrachus gutturosus	Guttural puddle frog	GF
Ptychadena longirostris	Snouted grass frog	GF
Conraua derooi	De Roo's giant frog	GF
Amnirana sp 'albolabris West'	West African white-lipped frog	GF
Pseudohymenochirus merlini	**Merlin's dwarf clawed frog**	UG
Sclerophrys danielae	Daniela's toad	UG
Sclerophrys togoensis	Togo toad	UG
Sclerophrys taiensis	Taï toad	UG
Sclerophrys chevalieri	West African horned toad	UG
Nimbaphrynoides occidentalis	**Nimba toad**	UG

This list excludes: i) species that are found in the forests of West Africa but also in forests elsewhere in Africa; ii) species that are endemic to West Africa but live mainly outside the forests; iii) many species of highland forests found in the mountains of the Nigeria-Cameroon ridge. GF = Guinean Forests; UG = Upper Guinea; LG = Lower Guinea. (Bold = endemic genus).

TABLE 6 continued...

Scientific name	Common name	Endemism
Acanthixalus sonjae	Sonja's spiny frog	UG
Kassina cochrananae	Cochran's running frog	UG
Kassina arboricola	Forest running frog	UG
Kassina lamottei	Lamotte's running frog	UG
Morerella cyanophthalma	**Morere's blue-eyed frog**	UG
Afrixalus fulvovittatus	Banded spiny reed frog	UG
Afrixalus vibekensis	Vibeke's spiny reed frog	UG
Hyperolius nimbaensis	Nimba reed frog	UG
Hyperolius nienokouensis	Niénokoué reed frog	UG
Hyperolius soror	Soror reed frog	UG
Hyperolius occidentalis	Western reed frog	UG
Hyperolius torrentis	Torrent reed frog	UG
Hyperolius picturatus	Painted reed frog	UG
Hyperolius bobirensis	Bobiri reed frog	UG
Hyperolius zonatus	Belted reed frog	UG
Hyperolius chlorosteus	Large green reed frog	UG
Hyperolius laurenti	Laurent's reed frog	UG
Hyperolius viridigulosus	Green-throated reed frog	UG
Leptopelis occidentalis	Western tree frog	UG
Leptopelis macrotis	Large-eared tree frog	UG
Astylosternus occidentalis	Western night frog	UG
Astylosternus laticephalus	Wide-headed night frog	UG
Cardioglossa occidentalis	Western long-fingered frog	UG
Arthroleptis aureoli	Mount Aureol squeaker	UG
Arthroleptis formosus	Beautiful squeaker	UG
Arthroleptis langeri	Langer's squeaker	UG
Arthroleptis nimbaensis	Nimba squeaker	UG
Arthroleptis crusculum	Evening squeaker	UG
Arthroleptis krokosua	Krokosua squeaker	UG
Phrynobatrachus intermedius	Intermediate puddle frog	UG
Phrynobatrachus tanoeensis	Tanoé puddle frog	UG
Phrynobatrachus tokba	Tokba puddle frog	UG
Phrynobatrachus hieroglyphicus	Hieroglyph puddle frog	UG

TABLE 6 continued...

Scientific name	Common name	Endemism
Phrynobatrachus sp 'Gola'	Gola puddle frog	UG
Phrynobatrachus alleni	Allen's puddle frog	UG
Phrynobatrachus brongersmai	Brongersma's puddle frog	UG
Phrynobatrachus guineensis	Guinea puddle frog	UG
Phrynobatrachus ghanensis	Ghana puddle frog	UG
Phrynobatrachus phyllophilus	Leaf-loving puddle frog	UG
Phrynobatrachus taiensis	Taï puddle frog	UG
Phrynobatrachus annulatus	Ringed puddle frog	UG
Phrynobatrachus villiersi	Villiers' puddle frog	UG
Phrynobatrachus fraterculus	Brother's puddle frog	UG
Phrynobatrachus maculiventris	Spotted-belly puddle frog	UG
Phrynobatrachus afiabirago	Afia's puddle frog	UG
Odontobatrachus arndti	Arndt's toothed frog	UG
Odontobatrachus natator	Common toothed frog	UG
Odontobatrachus smithi	Smith's toothed frog	UG
Odontobatrachus ziama	Ziama toothed frog	UG
Ptychadena submascareniensis	Small grass frog	UG
Ptychadena superciliaris	Large-eyed grass frog	UG
Conraua alleni	Allen's giant frog	UG
Amnirana occidentalis	Western white-lipped frog	UG
Sclerophrys perreti	Perret's toad	LG
Didynamipus sjostedti	**Dwarf toad**	LG
Afrixalus schneideri	Schneider's spiny reed frog	LG
Hyperolius bopeleti	Bopelet's reed frog	LG
Hyperolius endjami	Endjam's reed frog	LG
Hyperolius acutirostris	Sharpe-snouted reed frog	LG
Astylosternus diadematus	Crowned night frog	LG
Astylosternus fallax	False night frog	LG
Astylosternus schioetzi	Schiotz's night frog	LG
Astylosternus laurenti	Laurent's night frog	LG
Cardioglossa nigromaculata	Black-spotted long-fingered frog	LG
Leptodactylodon bueanus	Buea egg frog	LG
Leptodactylodon ovatus	Yellow-snouted egg frog	LG
Arthroleptis nlonakoensis	Nlonako squeaker	LG
Phrynobatrachus rainerguentheri	Günther's puddle frog	LG

FRESHWATER FISH

More than 600 species of freshwater fish have been recorded in the Guinean forests, making this a truly remarkable area for fish biodiversity. Many species are endemic, but it is difficult to draw up a precise list.

Around 25 % of killifish species in the world are found in the Guinean forests, and around half of these are endemic. These killies live in small streams and forest brooks: for example *Scriptaphyosemion schmitti*, which lives in a dense forest area in the coastal zone of Liberia; *Epiplatys coccinatus*, endemic to the inland wetlands in the centre of Liberia; and *Fundulopanchax powelli*, endemic to the inland wetlands in the south of the Niger Delta in Nigeria.

Callopanchax monroviae for its part is endemic to the inland wetlands of the Liberian coast.

The emerald aphyosemion (*Fundulopanchax scheeli*) is a species of killifish endemic to the lower basin of the Cross River in Nigeria.

Other freshwater fish species are threatened with extinction due to silting and pollution caused by deforestation (industrial crops and slash-and-burn agriculture) and mining. In Liberia, this is the case of the Barbus boboi (*Enteromius boboi*), found in the Farmington River, and the *Labeo curriei*, confined to the Via River, and possibly the Corubal River, in the Saint Paul River catchment area in Liberia.

Future research may provide a better understanding of the region's freshwater fish, and in particular of their ecological requirements, so that they can be protected more effectively.

Scriptaphyosemion schmitti. *(© K. Nilsson)*

Callopanchax monroviae. *(© Christian Cauvet)*

*The emerald aphyosemion (*Fundulopanchax scheeli*). (© Olivier Buisson)*

INSECTS

Among the tens of thousands of insects living in the Guinean forests, only certain groups are relatively well known, in particular butterflies and dragonflies.

BUTTERFLIES

There are thousands of species of butterfly in West Africa, divided into two main groups: moths (Heterocera) and diurnal butterflies (Rhopalocera).

There are more than 30 000 species of **moths** in sub-Saharan Africa, probably almost half of which live in West Africa.

Nearly 1 500 species of **diurnal butterflies** have been counted in West Africa, more than a third of the 4 000 known species in sub-Saharan Africa. The exact number living in the forest or peri-forest zone is difficult to determine, but certainly exceeds a thousand.

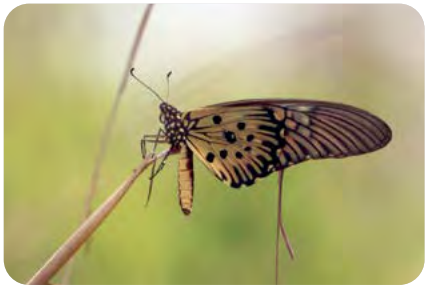
Butterflies play a particularly important role in forest ecosystems: as caterpillars they are both plant predators and prey for many animals; and the adults play an essential role in the pollination of various plant species.

Among the butterflies of the Guinean forests, the antimachus (*Papilio antimachus*) is emblematic. With a wingspan of up to 24 cm, it is the largest butterfly in Africa. It is rarely seen because it lives in the tree canopy, except when it patrols the hilltops in search of females.

As with other groups, the rate of endemism among butterflies is high, with at least 120 species endemic to Upper Guinea (and therefore limited to the west of Togo). In the Lower Guinea region, the area around the Cross River loop as far as western Cameroon is exceptional: the Oban Hills and Korup Forest region alone is home to more than 1 000 species, including several dozen endemics.

Caligatus angasii *(Euteliidae family), East Nimba Nature Reserve, Liberia. (© M. Languy)*

Euchromia *(Erebidae family), a moth active during the day, Libassa, Liberia. (© M. Languy)*



*A female antimachus (*Papilio antimachus*), East Nimba Nature Reserve, Liberia. (© M. Languy)*

Euphaedra modesta *is a beautiful forest dweller (Nymphalidae family), endemic to Upper Guinea. (© M. Languy)*

Another species endemic to Upper Guinea: Euriphene veronica*, from the Nymphalidae family. (© M. Languy)*

A further endemic of Guinean forests: Tetrahanis symplocus *(Lycaenidae family), Diecke Forest, Guinea. (© M. Languy)*

DAMSELFLIES AND DRAGONFLIES

The Odonata order comprises two main groups: the Zygoptera, commonly known as damselflies, and the Anisoptera, known as dragonflies, although the term dragonfly is often used for both groups.

Damselflies are typically smaller (just 2 cm for the genus *Agriocnemis*), with very slender bodies and wings folded along the body when at rest. Dragonflies, on the other hand, are often larger and more robust, holding their wings horizontally or slightly elevated when alighting. Some easily exceed 10 cm in wingspan. Most species are diurnal and wait for the sun before becoming active, although some rarer species specialise in hunting at dusk and are sometimes attracted at night by the light of lamps.

All dragonflies need water to reproduce. They lay their eggs there and the larvae take several weeks to develop before emerging and transforming into the imago (adult) and taking flight. However, outside the breeding season, some dragonflies can scatter far from waterholes.

Just over 300 species of odonata have been recorded in West Africa, half of which (156) are forest dwelling. Of these species found in Guinean forests, 68 are endemic, 47 of which are found only in Upper Guinea and 15 only in Lower Guinea (Tables 7 and 8).

As with butterflies, odonata play an important role in the forest ecosystems of West Africa because, as adults, they are prey for large birds such as bee-eaters and rollers, as well as small insectivorous falcons. The larvae are prey for fish, kingfishers and other predators. But adults, like larvae, are also carnivorous predators. Generally speaking, dragonflies are among the best natural indicators of water quality.

Pseudagrion camerunense, *a typical representative of the sub-order of damselflies (Zygoptera). (© M. Languy)*

Nesciothemis nigeriensis, *a typical representative of the sub-order of dragonflies (Anisoptera). (© M. Languy)*

*The orange jewel (*Chlorocypha luminosa*) lives exclusively in forests and prefers streams and small rivers. It is endemic to Upper Guinea. (© M. Languy)*

TABLE 7 Dragonfly species (Anisoptera) endemic to Guinean forests

Scientific name	Common name	Endemism
Anisoptera	Dragonflies	
Gomphidae		
Cornigomphus mariannae	Marianna's horntail	UG
Diastatomma gamblesi	Western hoetail	UG
Lestinogomphus africanus	Fairytail	UG
Lestinogomphus matilei	Western fairytail	UG
Lestinogomphus obtusus	Blunt-toothed fairytail	UG
Libyogomphus christinae	Western horntail	UG
Libyogomphus mamfei	Cameroon horntail	LG
Notogomphus cobyae	Coby's longleg	LG
Notogomphus maryae	Mary's longleg	LG
Onychogomphus cf. seydeli	Western dark claspertail	UG
Paragomphus kiautai	Kiauta's hooktail	UG
Paragomphus lemperti	Lempert's hooktail	UG
Paragomphus tournieri	Tournier's hooktail	UG
Phyllogomphus aethiops	Leaftail	UG
Phyllogomphus bartolozzii	Leaftail	UG
Phyllogomphus helenae	Helen's leaftail	UG
Phyllogomphus LIBERIA sp nov.	Liberia leaftail	UG
Phyllogomphus moundi	Leaftail	GF
Tragogomphus aurivillii	Horntail	LG
Tragogomphus grogonfla	Western horntail	UG
Libellulidae		
Eleuthemis umbrina	Shadow firebelly	UG
Malgassophlebia cf bispina	Western leaftipper	UG
Neodythemis campioni	River junglewatcher	UG
Orthetrum agaricum	Western mushroom skimmer	UG
Orthetrum sagitta	Salone skimmer	UG

Endemism: GF = Guinean Forests (Upper and Lower Guinea); UG = Upper Guinea only; LG = Lower Guinea only.

Hadrothemis versuta, *a species of dragonfly in the family Libellulidae, found in West and Central Africa. (© M. Languy)*

TABLE 7 continued...

Scientific name	Common name	Endemism
Tetrathemis godiardi	Western elf	UG
Trithemis africana	Western mantled dropwing	UG
Zygonyx annika	Annika's cascader	UG
Zygonyx chrysobaphes	Golden-winged cascader	UG
Zygonyx geminuncus	Western double-hooked cascader	UG
Macromiidae		
Phyllomacromia	African cruisers	
Phyllomacromia aeneothorax	Western bronze cruiser	UG
Phyllomacromia aequatorialis	Cruiser	UG
Phyllomacromia caneri	Gold-studded cruiser	LG
Phyllomacromia funicularioides	Nimba cruiser	UG
Phyllomacromia girardi	Giarad's cruiser	UG
Phyllomacromia lamottei	Western double-spined cruiser	UG
Phyllomacromia legrandi	Legrand's cruiser	UG
Phyllomacromia cf melania	'New' taxa split from *P. melania*	UG
Phyllomacromia occidentalis	Brown templed cruiser	UG
Phyllomacromia sophia	Ebony cruiser	UG

TABLE 8 Damselfly species (Zygoptera) endemic to Guinean forests

Scientific name	Common name	Endemism
Zygoptera	Damselflies	
Synlestidae		
Nubiolestes sp. nov.	'Guinea' malachite	UG
Argiolestidae		
Neurolestes nigeriensis	Gambles's flatwing	LG
Calopterygidae		
Sapho ciliata	Western bluewing	GF
Sapho fumosa	Smokewing	UG
Sapho puella	Clearwing	LG
Umma mesumbei	Cameroon sparklewing	LG
Chlorocyphidae		
Africocypha centripunctata	Banded jewel	LG
Chlorocypha jejuna	Togo red jewel	UG
Chlorocypha luminosa	Orange jewel	UG
Chlorocypha radix	Western red-tipped jewel	GF
Pentaphlebiidae		
Pentaphlebia gamblesi	Gambles's relic	LG
Pentaphlebia stahli	Red relic	LG
Pentaphlebiidae		
Allocnemis eisentrauti	Cameroon yellowwing	LG
Allocnemis elongata	Orange-legged yellowwing	GF
Allocnemis flavipennis	Amber yellowwing	GF
Allocnemis subnodalis	Blue-legged yellowwing	GF
Allocnemis vicki	Blue-shouldered yellowwing	LG
Mesocnemis tisi	Sinoe riverjack	UG
Elattoneura dorsalis	Salone threadtail	UG
Elattoneura girardi	Candy threadtail	UG
Elattoneura villiersi	White-shouldered threadtail	UG
Copera guttifera	Western featherleg	UG
Coenagrionidae		
Agriocnemis angustirami	Liberian wisp	UG
Ceriagrion citrinum	Yellow citril	LG
Pseudagrion cyathiforme	Scoop-tailed slim sprite	UG
Pseudagrion mascagnii	Salone sprite	UG
Pseudagrion risi	Cameroon sprite	LG
Pseudagrion pacale	Peace sprite	UG

Endemism: GF = Guinean Forests (Upper and Lower Guinea); UG = Upper Guinea only; LG = Lower Guinea only.

A termite mound in undergrowth, Tiwai Island Wildlife Sanctuary, Sierra Leone. (© M. Languy)

*The tiger beetle (*Hipparidium interuptum*), Sapo National Park, Liberia. (© M. Languy)*

Rhynocoris nitidulus *(Hemiptera order, Reduviidae family) is a type of assassin bug, predators of other insects, Diecke Forest, Guinea. (© M. Languy)*

OTHER INSECTS

There are many other types of insects living in Guinean forests, playing a decisive role in the ecological pyramid of forest environments. Many larvae also help to transform living or dead plants into decomposed organic matter, then into minerals that fertilise the soil. Dead wood is recycled, soils are aerated, and thousands of species are fed or eaten by insects. Termites, for example, are social insects that live in hierarchical colonies organised into castes; by feeding on dead wood they play an important role in the plant cycle. Some species build termite mounds, which are large nests made from chewed-up earth.

A column of ants moving eggs and larvae. (© M. Languy)

A freshwater crab in a low altitude river in the East Nimba Nature Reserve, Liberia. © M. Languy.

OTHER ANIMAL GROUPS

Many other invertebrates live in Guinean forests, including **freshwater crabs**, some of which are known only from a few localities. These are extremely sensitive to water quality and therefore very good indicators of the health of ecosystems.

Another very diverse group is represented by **spiders**. The majority of forest spiders are nocturnal, able therefore to escape many potential diurnal predators, in particular birds.

Numerous diplopods (**millipedes, centipedes** and others) roam the floor of Guinean forests.

Freshwater **molluscs** are not generally regarded as charismatic, rarely attracting the attention of the popular media. However, they play a crucial role in maintaining wetland ecosystems by controlling water quality and nutrient balance. They are relatively well known in much of West Africa because some species act as intermediate hosts for parasitic flatworms.

One very rare relict species that should be considered a research and conservation priority is *Pleiodon ovatus*. This bivalve mollusc has probably become confined to a single river, the Gbangbaia in Sierra Leone, due to its extinction in other parts of West Africa.

A tarantula of the Stromatopelma *genus, Tiwai Island Wildlife Sanctuary, Sierra Leone. (© M. Languy)*

A member of the Chelodesmidae family. (© M. Languy)

*Campylospermum (*Campylospermum sp*), Camp Mangabey, Taï National Park, Côte d'Ivoire. (© Benjamin Schweinhart, Tremarctos Photography)*

PLANT SPECIES

The forests of Upper Guinea contain around 2 800 plant species, of which 650 are thought to be endemic. Within the Guinean forests, 20 % of plant species are endemic, i.e. around 1 800 species, and terrestrial plant species richness is estimated at over 9 000 species. The Taï National Park site (Côte d'Ivoire), the Mount Nimba landscape on the Liberia-Guinea-Côte d'Ivoire border, and the Cross River National Park (Nigeria) are characterised by particularly high plant richness. The dense rainforests of West Africa are characterised by a high preponderance of woody species from the Fabaceae family, and especially from the Caesalpinioideae subfamily. In the evergreen forests, species of the genera *Soyauxia*, *Berlinia* and *Cynometra* are particularly common. In semi-deciduous mixed forests, there are monodominant stands (dominated by a single species), composed of species such as apomé (*Cynometra ananta*), *Gilbertiodendron preussi*, or ekaba (*Tetraberlinia tubmania*), which are found only in Liberia.

Tropical forests are characterised by forest stands of at least 30 m in height. A large number of epiphytes, organisms (plants, fungi, lichens, etc.) that grow using other plants as support, and lianas, such as those of the *Agelaea*, *Combretum*, *Salacia*, and *Strychnos* genera, are also very characteristic of these forests.

Diversity of saprotrophic fungi of the dense forests of Guinea. a. Phillipisa sp. *from the dense Ziama Classified Forest (Guinea, © Yorou NS); b:* Xylaria poiteana, *Kpalime Forest (Togo, © Yorou NS); c:* Trametes flavida, *semi-deciduous dense Lama Forest (Benin, © Olou AB); d:* Scytinopogon angulispora *from the dense Niaouli Forest (Benin, © Yorou NS); e:* Thamnomyces dendroidea *from the dense Obuasi Forest (Ghana, © Yorou NS); f:* Cookeina tricholoma *from the dense Lama Forest (Benin, © Yorou NS); g:* Trogia infundubiliformis *from the dense Niaouli Forest (Benin, © Olou AB); h:* Microporus xanthopus *from the dense Lama Forest (Benin, © Olou AB); i:* Laxitextum bicolor *from the dense Lama Forest (Benin, © Olou AB); j:* Ramaria sinsinii *from the dense Pobè Forest (Benin, © Yorou NS).*

SIDEBAR 1 THE HIGHER FUNGI OF THE GUINEAN DENSE FORESTS

Fungi are generally grouped into three categories according to their way of life: parasites, saprotrophs and symbionts. **Parasitic fungi** are those that live at the expense of other living organisms (plants, animals, fungi, etc.) from which they draw the nutrients they need to grow and reproduce. **Saprotrophic fungi** live by decomposing dead organic matter to extract carbon, while **symbiotic fungi** obtain nutrients through a mutually beneficial relationship with other organisms (plants, insects, algae, etc.). There are several types of symbiosis involving fungi, but mycorrhizal symbiosis (symbiosis between fungi and chlorophyllous plants) is the most common of all terrestrial symbioses. Seven different classes of mycorrhizal symbiosis are recognised, all of which fall into three broad categories based on the anatomy of the mycorrhiza, the group of fungi and the plants involved in the symbiosis. The three main categories of symbiosis are ectomycorrhizal (EcM) symbiosis, ecto-endomycorrhizal symbiosis, and endomycorrhizal symbiosis. Of these seven classes, the EcM symbiosis is the most common in tropical African forests, as it targets forest trees exclusively. They are also very often accompanied by fruiting bodies that appear on the surface of the forest floor, which are generally harvested by local people.

Due to the absence of bushfires, which allow dead organic matter to accumulate, coupled with the scarcity of trees that are partners to fungi, Guinea's dense forests represent preferential habitats for **saprotrophic fungi**. Saprotrophic fungi belonging to the large group of Polypores, Agaricaceae, Lepiotaceae, Xylariaceae, Hymenochetaceae (see image) and others, dominate both in terms of species richness (up to 70 % of species) and fresh biomass (up to 80 % of total fungal biomass). Many species are used by local populations as food and medicinal resources. Their industrial use also presents major opportunities: on the one hand, because of their very high enzymatic synthesis capacity, primarily aimed at

Diversity of ectomycorrhizal fungi in the dense forests of Guinea. a: Lactifluus pelliculatus *from the Ziama Classified Forest (Guinea, © Yorou NS); b:* Russula sp. *(SYN 2444) from the Mount Nimba Nature Reserve (Guinea, © Yorou NS); c:* Cantharellus guineensis *from the Bassila gallery forest, reported in dense forest in Cameroon (© Yorou NS); d:* Russula sp. *(SYN 2459) from the Ziama Classified Forest (Guinea, © Yorou NS); e:* Lactifluus *from the Ziama Classified Forest (Guinea, © Yorou NS); f:* Cantharellus congolensis *from the gallery forest of the Kota Falls in Benin, reported in dense forest in Cameroon (© Yorou NS)*

fragmenting complex lignite and cellulose chains, many species are used in the cosmetics and paper industries; on the other hand, certain species, including representatives of the Xylariaceae family, are potential candidates for screening secondary metabolites for the pharmaceutical industry. However, the most crucial ecosystem service provided by saprotrophic fungi is the decomposition of dead organic matter and the recycling of carbon.

While the dense evergreen forests of the Guinean-Congolese block are generally poor in EcM trees, groves dominated by these trees are present locally. The rest of the time, these EcM trees are isolated and scattered throughout the Guinean forest massifs. Throughout the Guinean forest hotspot, members of the Fabaceae family (*Gilbertiodendron dewevrei, Afzelia africana, A. bella, A. quenzensis, Berlinia grandiflora, B. bracteosa, B. confusa, B. crabiana, Paraberlinia bifoliolata, Brachystegia zenkeri, Monopethalantus letestui, M. microphyllus, Anthonnota* spp.) and the Phyllantaceae family (*Uapaca guineensis, U. esculenta, U. acuminata, U. vanhoutei*) are the most common. The presence of these trees favours the establishment of the EcM symbiosis, and consequently the presence of representative symbiotic fungi belonging to the Russulaceae, Cantharellaceae, Boletaceae, Amanitaceae, Thelephoraceae and Inocybaceae families, to name but a few (see image, above). In these groves, symbiotic fungi have much higher biomasses than other groups of fungi. In most cases, these species are excellent edible specimens and are regularly harvested by local populations. Their ecological role is crucial in that they assist and maintain these groves by mobilising mineral salts for the partner trees.

Professor Nourou Soulemane Yorou, mycologist, University of Parakou, Benin

Plateau and waterfalls of Fouta Djallon, Guinea.
(Robert Harding / Alamy)

Depending on climatic and soil conditions, several types of tropical rainforests can be distinguished. The parameter that most influences the vegetation gradient is rainfall:

- The types of evergreen rainforests (wet evergreen forest and moist evergreen forest) on the coastal zone, where rainfall exceeds 1 750 mm per year. The canopy height is around 30 to 40 m.
- Semi-deciduous rainforests occur in areas with rainfall between 1 250 and 1 750 mm, where evergreen and deciduous tree species are mixed. The canopy is up to 50 m high.
- A mosaic of tropical dry forests and rainforests occur in the transition zone towards the more arid outlying areas.

A characteristic feature of tropical evergreen rainforests is the large number of Caesalpinioideae, such as those of the genera *Soyauxia, Berlinia* and *Cynometra*. The azobé (*Lophira alata,* Ochnaceae), a pioneer tree species, is also abundant.

The semi-deciduous rainforest is relatively rich in species. Tall trees such as the tiama (*Entandrophragma angolense*, Meliaceae), kossipo (*Entandrophragma candollei*, Meliaceae) and badi or bilinga (*Nauclea diderrichii*, Rubiaceae) are found here.

Of note are swamp forests that develop on large depressions where water accumulates. A varied and often endemic flora can be found here, for example abura (or bahia) (*Mitragyna ciliata* and *Mitragyna stipulosa*, Rubiaceae), rikio (*Uapaca guineensis*, Euphorbiaceae), *Symphonia globulifera* (Clusiaceae), *Berlinia auriculata* (Fabaceae), *Carapa procera* (Meliaceae) and *Diospyros longiflora* (Ebenaceae). The increasingly longer periods of flooding in these areas results in palms (*Raphia* spp., Arecaceae) gradually replacing tree species.

Guinean highland forests are also found on the high plateaus of the 'Guinean backbone', which includes the Fouta Djallon plateau and the Nimba, Ziama and Fon massifs.

Altitudes are not high enough to produce distinct Afromontane formations. Above 1 000 m, the plateau and hillside forests are dominated by *Parinari excelsa* (Chrysobalanaceae), a species often growing to 30 m or more. On the high plateaus of Upper Guinea, on the other hand, its size diminishes as altitude increases, eventually dominating a forest of just 10 m in height. Here the undergrowth is not dense and lianas are rare, and the tree flora is made up almost entirely of species that are also found on the plains. Above 800 m, and especially above 1 000 m, fogs are frequent and ferns and epiphytes become abundant. Guinea's highland forests have been severely reduced by fire; their remnants that remain in ravines, the rocky outcrops and the relief provide natural firebreaks.

Mangroves near the town of Marshall, Liberia. (© M. Languy)

MANGROVE

Mangroves are dominated by trees or shrubs that grow on banks with frequent alternating tides of seawater. Species unique to mangroves are adapted to these living conditions, for example with thick foliage that protect them, the production of seeds that germinate before detaching from the mother plant, and their pneumatophores, or aerial roots, which are exposed during low tide.

The species typical of West African mangroves are *Rhizophora mangle, Rhizophora harrisonii, Rhizophora racemosa* (Rhizophoraceae), *Avicennia germinans* (Acanthaceae) and *Laguncularia racemosa* (Combretaceae).

OTHER VEGETAL TYPES

Aside from trees and flowering plants, Guinean forests are home to a wide variety of plant life (ferns, mosses, lichens, etc.), as well as fungi. This world remains largely unknown and deserves much greater attention. Plants as a whole are a veritable 'medicine chest', containing substances from which medicines are developed or copied. The vast majority of communities living in the forests of West Africa regularly use various leaves and roots as remedies for various ailments.

2.3 THE DIVERSITY OF HUMAN POPULATION IN THE FORESTS OF WEST AFRICA

The Guinean forest countries of West Africa have a combined population of 282.6 million people (Table 9). As the area is limited by biogeographical, rather than political, boundaries, population data specific to the Guinean forests is not readily available or up to date. The total population of the Guinean forests hotspot rose from 81.5 million in 2000 to 105.5 million in 2010, an increase of 2.6 % per year over the period, with one of the highest growth rates among biodiversity hotspots. West Africa had a population of more than 391 million in 2019, representing 30 % of Africa's total population. Nigeria alone accounts for more than half of West Africa's population, with around 200 million inhabitants in 2019. Population growth is very strong: West Africa gains almost 10 million inhabitants every year and is expected to reach 754 million by 2050. This population growth is one of the main threats to biodiversity in the region, because of the need for land, protein and fuelwood that it implies.

In line with much of Africa, the countries of the West African forest zone had some of the highest population growth rates in the world at the beginning of the 21st century.

TABLE 9 Key demographic data for the countries in the Guinean forests hotspot

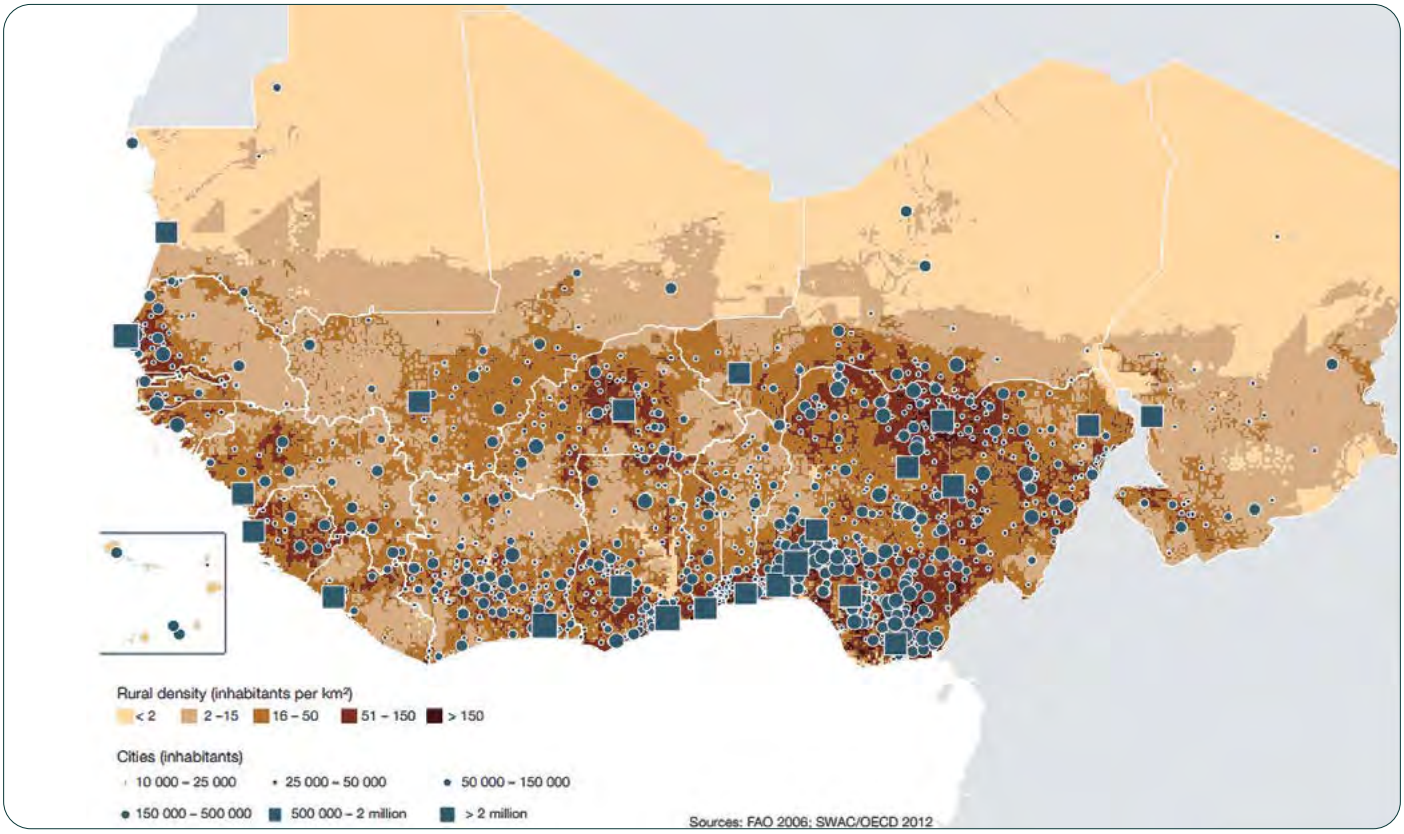
Country	Territory (km²)	Annual population growth rate 2010-2015 (%)	Population in 2019 (millions)	Population density in 2019 (inhabitants per km²)	Estimated population in 2050 (millions)
Guinea	245 857	2.5	12.77	51.94	25.97
Sierra Leone	245 857	2.1	8.81	108.91	12.95
Liberia	111 369	2.6	4.94	44.33	9.34
Côte d'Ivoire	322 463	2.2	25.72	79.75	51.26
Ghana	238 533	2.3	30.42	127.52	52.02
Nigeria	923 768	2.5	200.96	217.55	401.32
Total countries of the Guinean forests of West Africa	1 913 750	-	282.62	147.68	552.85
Total West Africa	6 140 568	-	391.43	63.75	754.04
Total sub-Saharan Africa	24 328 299	-	1 066.28	43,.83	2 117.73
Total worldwide	134 670 807	-	7 713.47	57.28	9 735.03

Sources: Sources: UNEP (2008), World Bank (2013 and 2020), Global Footprint Network (2010), UNDP (2013), and https://www.tresor.economie.gouv.fr/Pays/CI/perspectives-demographiques-en-afrique-de-l-ouest#:~:text=La%20population%20en%20Afrique%20de%20l'Ouest%20(CEDEAO%20et%20Mauritanie,en%202100%20(%2B284%25).

Twenty of the highest annual growth rates observed were in Africa, and Liberia had the highest growth rate in the world in 2007 (4.8 %). However, population growth in most countries in the region appears to have slowed in recent years. Most of the forested countries in West Africa have now posted growth rates of 'only' just over 2 % a year in recent years (Table 9). The exceptions are Ghana, Guinea and Liberia, which all have current growth rates estimated at over 2.5 %. Nigeria is the most populous country in Africa (and the 7th most populous in the world in 2013) and is projected to have a population of over 400 million by 2050. It also has one of the highest population densities in the region: 201 inhabitants per km² on average.

Human population density in 2019 averaged 148 people per km² across the region. However, population centres are unevenly distributed. While many localities in the area may have between 10 and 100 people per km², population densities can reach higher values in large cities (Figure 4). For example, the average human population density in Liberia, in Upper Guinea, is 5 inhabitants per km², while it reaches 218 inhabitants per km² in Nigeria, in Lower Guinea. The low human population density in rural Liberia correlates with the retention of large forest blocks (see Section 2.5).

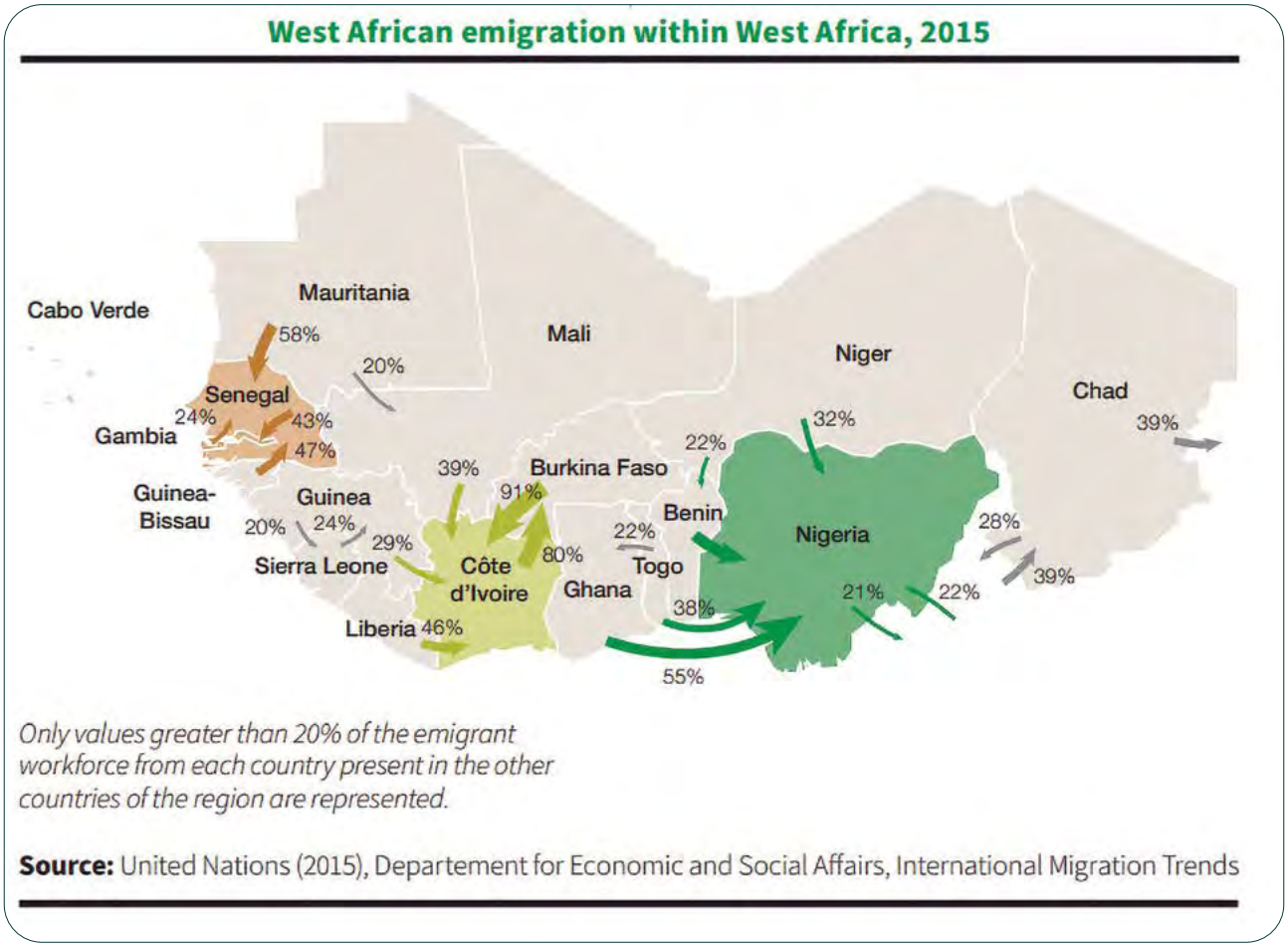
FIGURE 4 Human population densities in rural areas and urban centres in West Africa in 2013



Source: Sahel and West Africa Club (OECD/SWAC), 2016.

There are nine population centres with at least 500 000 people in the Guinean forests zone of West Africa: Conakry in Guinea, Freetown in Sierra Leone, Monrovia in Liberia, Abidjan in Côte d'Ivoire, Kumasi in Ghana, and Abeokuta, Ibadan, Benin City and Port Harcourt in Nigeria. Accra in Ghana, with a population of 2.3 million, is directly adjacent to the zone and is heavily dependent on the ecosystem services it provides. In the sub-region of the Upper Guinean forests, population centres are generally smaller and less clustered than in the Lower Guinean sub-region. Other notable population centres are found in the Sierra Leone sector of the forest zone in the towns of Kenema, Koidu and Makeni, and in the Ivorian sector in the towns of Man and Yamoussoukro. In Ghana, human presence can be found across almost the entire area covered by the Guinean forests (albeit often at low densities), while in the other forested countries of West Africa, vast tracts of unpopulated land are still present. It's in Liberia that we find the lowest human presence in the zone, with a large part of the country still uninhabited. However, strong demographic growth is threatening areas that are still relatively undisturbed. Densely populated localities tend to be concentrated in coastal areas.

FIGURE 5 West African emigration within West Africa



Source : OECD, 2016.

2.3.1 MIGRATION TRENDS

In West Africa, large populations of young people from countries in the north of the region (such as Mali and Burkina Faso) migrate south in the hope of finding better economic opportunities in countries such as Cameroon, Ghana and Liberia. Côte d'Ivoire and Nigeria are major centres of migration in the sub-region (Figure 5). At the same time, (ex-)pastoralists are moving south, in order to settle there and practise agriculture, particularly in response to the climate change observed in their native grazing lands (reduced rainfall, increased periods of drought and higher temperatures). As the effects of climate change are increasingly felt, this trend towards migration southwards is likely to put significant pressure on natural resources and increase the threats to the conservation and sustainable use of Guinean forests.

Three countries in the region (Côte d'Ivoire, Liberia and Sierra Leone) have been the scene of serious conflicts and civil wars over the last 20 to 30 years. These troubles have had repercussions, not only on the countries directly affected but also on the region as a whole. An estimated 250 000 people have been killed in Liberia's civil wars, and more than a third of the country's population is thought to have been displaced to neighbouring countries. Sierra Leone's civil war claimed almost 70 000 lives and displaced

Detail of a strip-woven cotton textile from the Ewe people of south-east Ghana. (J Marshall - Tribaleye Images / Alamy Stock Photo)

2.6 million people. Since 2009, the activities of the jihadist group Boko Haram have also led to the displacement of populations in northern Nigeria and have had repercussions in parts of northern Cameroon. All forms of unrest and conflict, even on a smaller scale, can have serious internal and cross-border consequences, with mass migrations of refugees, and large increases in human population density in new settlements and informal camps. These situations are likely to lead to serious land and resource degradation in areas where resource and infrastructure capacities are insufficient to cope with high local population concentrations. High levels of environmental degradation can also lead to social and political collapse and conflict between populations living on the periphery of these protected areas.

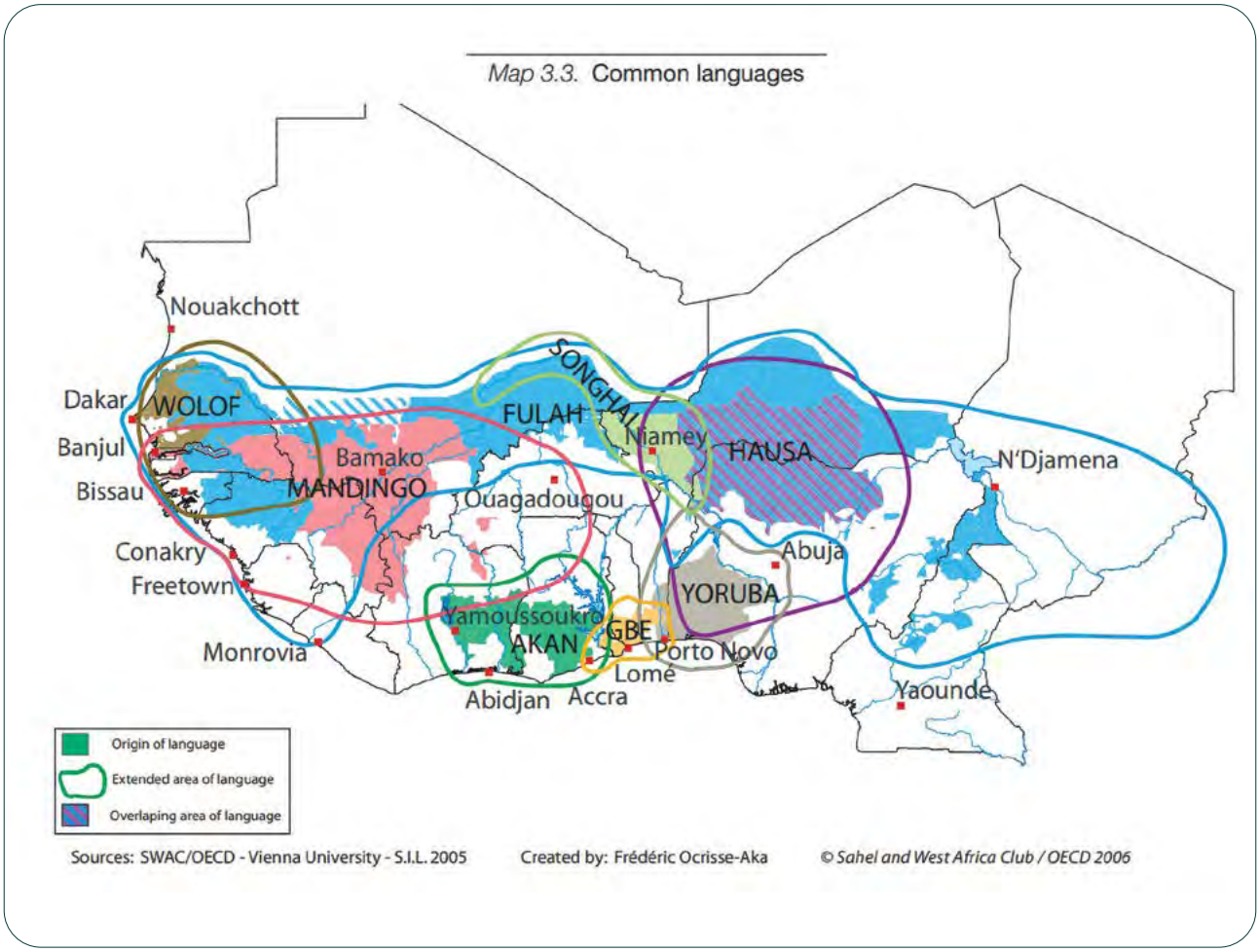
2.3.2 ETHNOLINGUISTIC GROUPS AND LANGUAGES

West Africa has a large number of ethnolinguistic groups, many of which are mixed and transboundary. Following the colonial division of states from south to north, many groups found themselves split between several states (Figure 6).

West Africa is home to a large number of ethnolinguistic groups that differ in terms of where they live, their culture, way of life and language. In forested areas, the peoples of the region are made up of numerous fragmented ethnic groups, historically organised into autonomous clans. The main ethnic groups found in the countries of the Guinean forests of West Africa are as follows (Figure 7):

- **Côte d'Ivoire:** Akan (42.1 %), Voltaic or Gur (17.6 %), Northern Mande (16.5 %), Kru (11 %), Southern Mande (10 %), others (2.8 %);
- **Ghana:** Akan (47.5 %), Mole-Dagbon (16.6 %), Ewe (13.9 %), Ga-Dangme (7.4 %), Gurma (5.7 %), Guan (3.7 %), Grusi (2.5 %), Mande-Busanga (1.1 %), others (1.6 %);
- **Guinea:** Fula (40 %), Malinke (30 %), Susu (20 %), other small groups (10 %);
- **Liberia:** Kpelle (20.3 %), Bassa (13.4 %), Grebo (10 %), Gio (8 %), Mano (7.9 %), Kru (6 %), Lorma (5.1 %), Kissi (4.8 %), Gola (4.4 %), other ethnic groups (20.1 %);
- **Nigeria:** Over 250 ethnic groups, the most common being: Hausa and Fulani (29 %), Yoruba (21 %), Igbo or Ibo (18 %), Ijaw (10 %), Kanuri (4 %), Ibibio (3.5 %), Tiv (2.5 %);
- **Sierra Leone:** Temne (35 %), Mende (31 %), Limba (8 %), Kono (5 %), Krio (2 %), Mandingo (2 %), Loko (2 %), other groups including Liberian refugees (5 %).

FIGURE 6 Main language areas and ethnic groups in West Africa



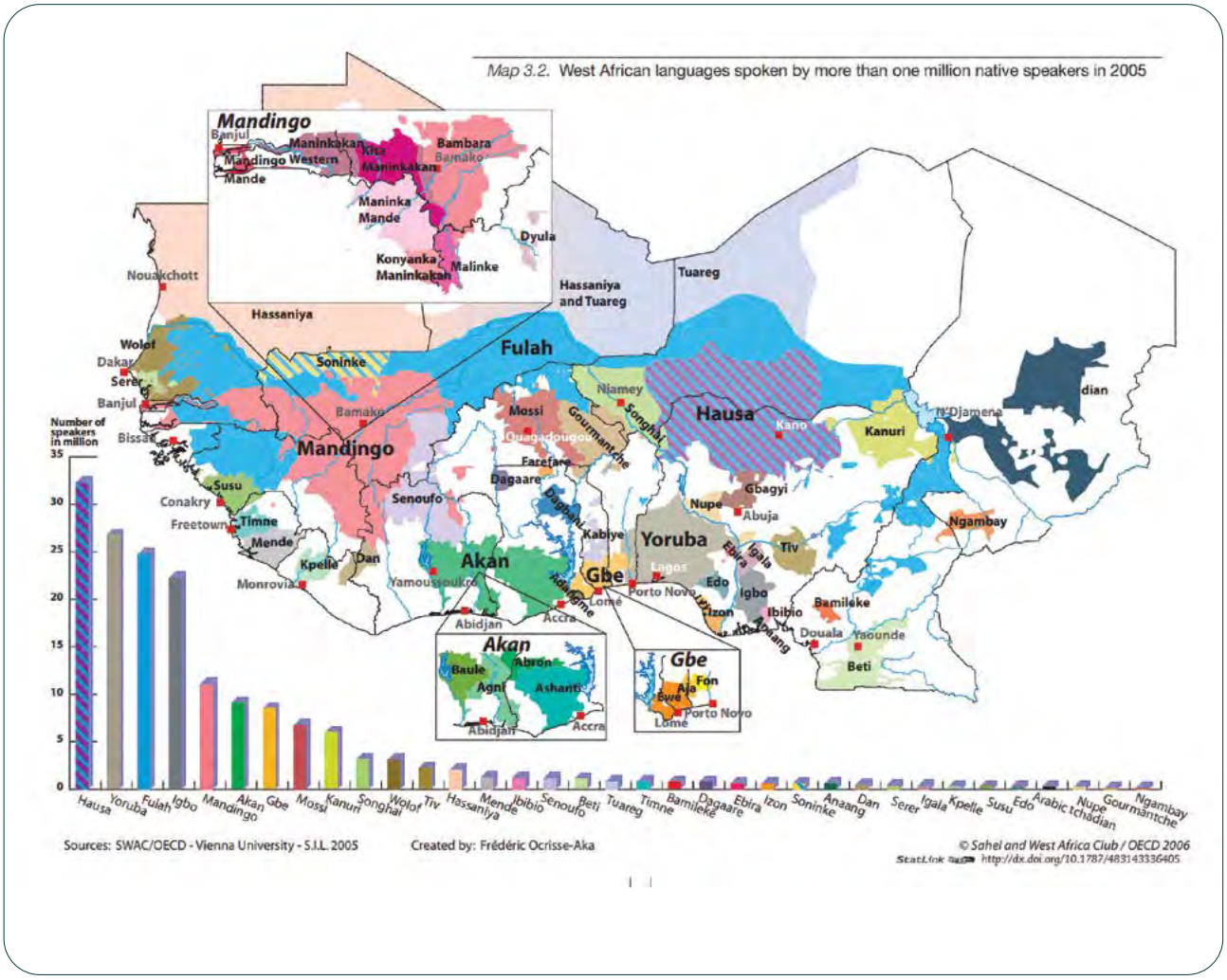
Source : Sahel and West Africa Club (OECD/SWAC), 2006.

In most countries, the official languages are those of the former colonial power. Most countries in West and Central Africa are either English- or French-speaking, and in some cases bilingual (e.g. Cameroon). However, the languages used in practice in the region are quite varied: Nigeria alone has 529 officially recognised languages. Nigeria is part of a centre renowned for its global biocultural diversity, including linguistic diversity. In several countries, a form of creole is used (for example, Krio is spoken by 90 % of the population of Sierra Leone). There are also Semi-Bantu people in some localities.

The diverse range of ethno-linguistic groups present in the area means that minority groups may be marginalised. Among the countries in the region, Côte d'Ivoire, Guinea and Nigeria are cited as having ethnic communities at risk of repression. Among these countries, Nigeria ranks 12th in the world in terms of threats to ethnic groups, due in particular to the activities of Boko Haram in the north of the country, but also to the deep-rooted conflicts between sedentary farmers and nomadic herders. The political and economic marginalisation of certain groups can also be observed in the countries of the zone, due to issues relating to land rights. However, there is no evidence to suggest that ethnic diversity per se is an impediment to conservation.

Urbanisation and rural exodus in West Africa have been very high over the last 70 years (Figure 8). However, the rural populations of the Guinean forest countries are still

FIGURE 7 Main West African languages



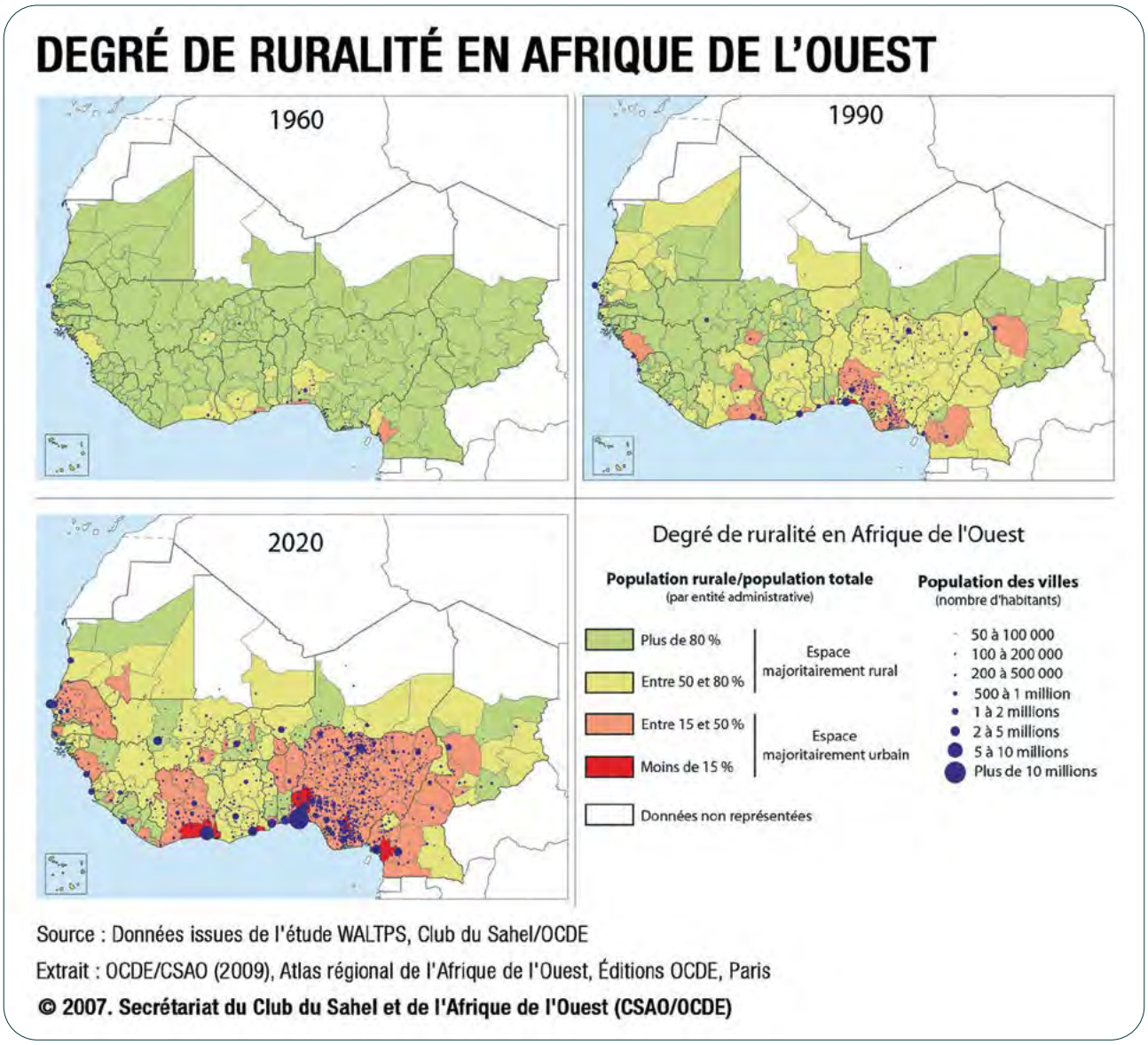
Source : Sahel and West Africa Club (OECD/SWAC), 2006.

heavily dependent on the forests and the resources they produce for their livelihoods. In Liberia, for example, almost 50 % of Liberian households live close to a forest and depend on it for food, energy, building materials, traditional medicines and so on. On average, 40 timber or non-timber forest products are harvested by these households. They are used for personal consumption within the household and/or for marketing to contribute to income (on average 35 % of total income). The most common use is as a source of energy (firewood for cooking). Forest products are often used in times of crisis (financial, food or climatic) and are therefore an important factor in household resilience.

2.4 THE MAIN THREATS TO THE DENSE RAINFORESTS OF WEST AFRICA

Human population growth in West Africa is one of the highest in the world, and the rate of demographic growth does show signs of decline, unlike in other tropical regions. As with other major natural ecosystems, the forests of West Africa are therefore subject to a correlative increase in all human activities, which have a direct and indirect impact on their composition and functioning. The main threats are of several kinds: (i) deforestation, i.e. the destruction of forest cover through the conversion of forest into another form of land use; (ii) forest degradation, which involves changes in the composition and structure

FIGURE 8 Urbanisation and rural exodus in West Africa. Trends from 1960 to 2020



Source : Sahel and West Africa Club (OECD/SWAC), 2006.

of the plant component of forests; (iii) defaunation, i.e. changes in the composition and structure of the animal component of forests; and finally (iv) climate change, which influences the behaviour of plant and animal species and their interactions.

Deforestation is particularly significant in the tropics. West Africa has lost 36 % of its tropical rainforest since 1990, from almost 346 000 km² of dense rainforest in 1990 to 221 000 km² in 2020. Of this 221 000 km², only 156 000 km² is forest undisturbed by human activity. The loss of non-degraded forests in West Africa since 1990 amounts to 55 %. The situation in this region is very different from that on the continent as a whole, particularly because of the human population density mentioned earlier.

Deforestation and forest degradation increased sharply between 1990 and 2020 in all West African countries (Table 10) (except in Guinea, where the increase is less marked than in other countries). Forest cover in these countries is in freefall, particularly in Côte d'Ivoire, which lost between 75 % and 80 % of its forest cover between 1990 and 2022.

A pile of illegally harvested rosewood, Outamba-Kilimi National Park, Sierra Leone. (© M. Languy)

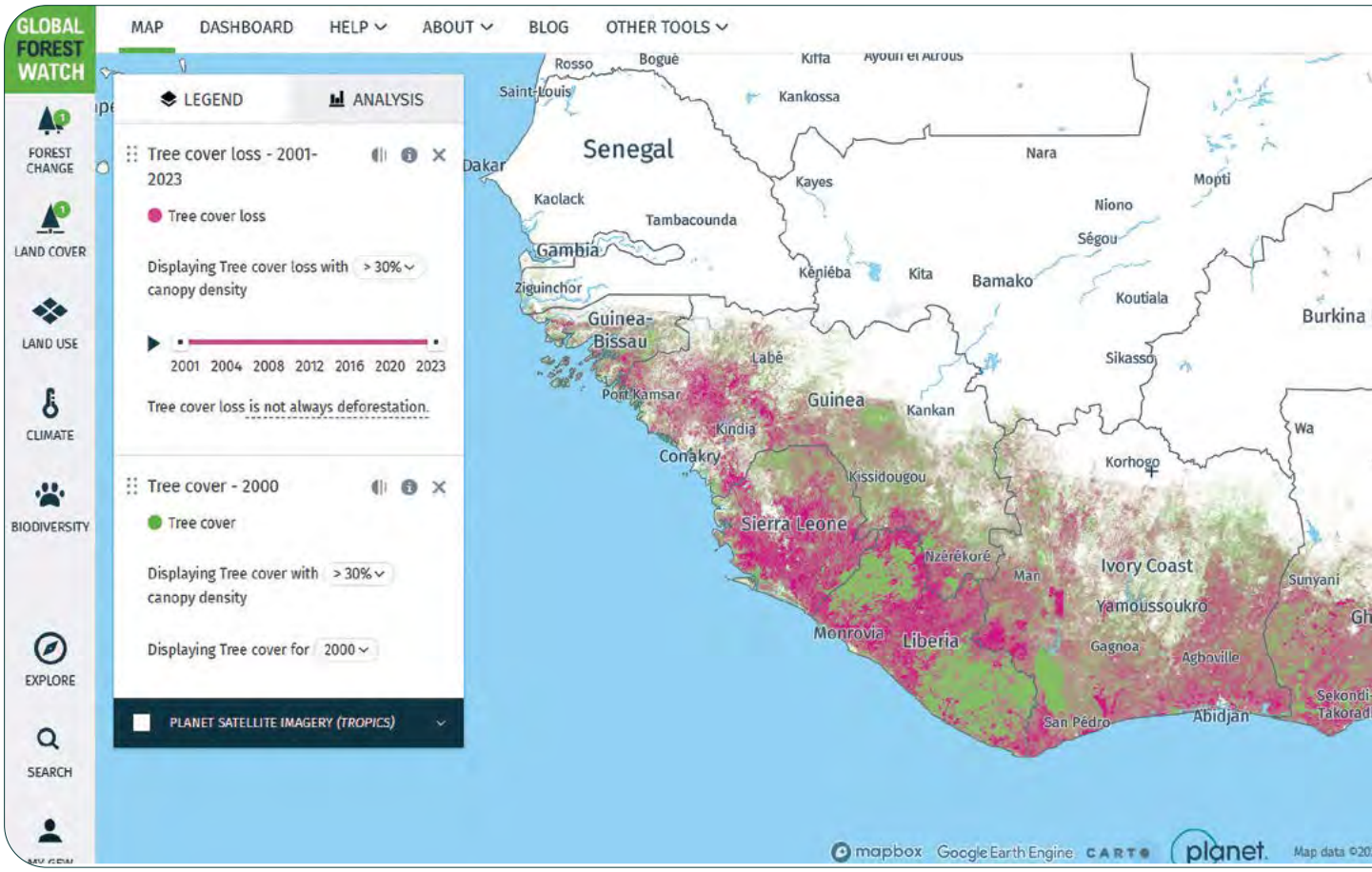
TABLEAU 10 Changes in forest cover, deforestation and forest degradation in West African countries between 1990 and 2022

Country	Surface area (km²)	Forest cover (non-degraded tropical forest) (km²)					Total deforestation (km²)			Degradation (km²)		
		1990	2000	2010	2020	2022	1990-1999	2000-2009	2010-2019	1990-1999	2000-2009	2010-2019
Côte d'Ivoire	322 463	73 454	66 158	43 315	16 900	15 343	1 728	7 650	23 834	882	7 756	11 749
Ghana	111 369	47 518	45 141	32 914	15 563	14.372	258	2 327	10 319	102	6 637	9 550
Guinea	322 463	20 124	14 682	8 187	5 085	4 870	1 565	4 167	5 974	501	1 336	1 454
Liberia	238 533	86 980	85 511	73 645	58 389	56 468	49	857	5 868	1 126	7 857	10 774
Nigeria	923 768	73 100	70 224	59 310	43 174	40 303	349	2 804	10 746	529	4 996	7 280
Sierra Leone	71 740	32 917	28 464	13 632	6 917	6 402	6 636	5 960	10 333	847	4 349	3 476
Total West Africa	1 913 730	334 093	310 180	231 003	146 028	137 758	10 585	23 765	67 074	3 987	32 931	44 283

Deforestation corresponds to the cumulative amount of deforestation (direct and after degradation) over the period. Degradation corresponds to the cumulative amount of degradation not followed by deforestation over the period.

Source : Vancutsem et al., 2021 https://forobs.jrc.ec.europa.eu/TMF/data#stats.

FIGURE 9 Changes in forest cover over the period 2010-2022



Source : www.globalforestwatch.org/map.

Projections for 2050 in terms of forest cover (tropical rainforest) and loss of forest cover compared with 2019 for four of the six target countries of this book are presented in Table 11. These figures illustrate the alarming nature of the situation and show that the forest could disappear completely from Côte d'Ivoire and Ghana by 2050 if the current trend is not changed. However, this analysis does not take into account the important role of protected areas such as Taï in Côte d'Ivoire and others in Ghana, which could hold out and represent the last bastions of intact forest in these countries in the long term.

The main factors causing these threats to Africa's tropical forests are shown in Table 12, together with the percentages of deforested or degraded areas affected by each factor. The expansion of agricultural activities (subsistence and commercial) is the main historical cause of deforestation, and to date, it is estimated that 80 % of the original distribution area of Guinean forests has been converted into an agricultural and forest mosaic.

Forest degradation particularly affects mature forests, defined as natural forests of native species that do not appear to have been modified by human activities or their impacts[5]. Mature forests still cover 888 910 km² in Central and West Africa, or 8 % of the world's mature forests. However, these forests would be subject to the highest rate of degradation observed, with a loss of 8 180 km² per year (the majority of which would be found in Central Africa, in the Democratic Republic of Congo).

5 This definition could be called into question by the impact of climate change. Climate change now affects the entire planet. Considering that a large part of its origin is anthropogenic, there would no longer be any ecosystem that is not influenced by human activities.

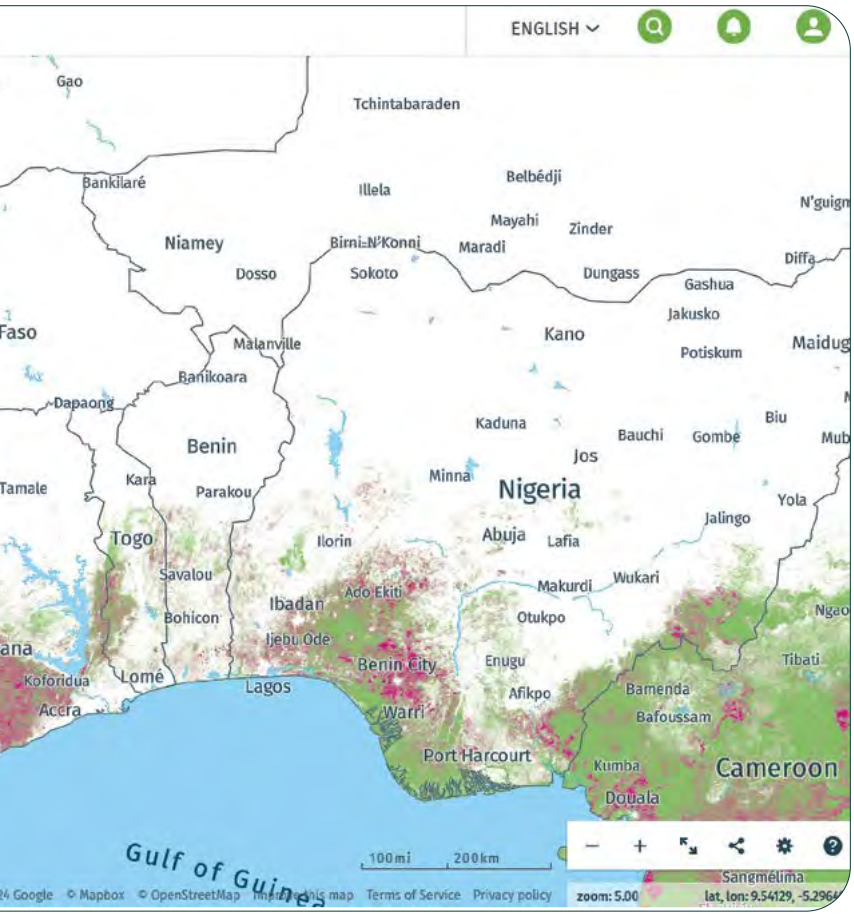


TABLE 11 Estimate of total forest cover (undisturbed tropical rainforest and disturbed forest) in 2050 if current conditions are maintained

Country	Surface area (km²)	Estimated forest cover in 2050 (non-degraded tropical rainforest) (km²)	Estimated relative loss of non-disturbed forest cover since 2019	Estimated forest cover in 2050 (total tropical rainforest) (km²)	Estimated relative loss of forest cover since 2019
Côte d'Ivoire	322 463	0	100 %	0	100 %
Ghana	238 533	0	100 %	0	100 %
Guinea	245 857	ND	ND	ND	ND
Liberia	111 369	14 000	76 %	52 000	33 %
Nigeria	923 768	0	100 %	29 000	53 %
Sierra Leone	71 740	ND	ND	ND	ND

ND = no data available.
Source : Vancutsem et al., 2021 https://forobs.jrc.ec.europa.eu/TMF/data#stats.

TABLE 12 Main drivers of deforestation and forest degradation in Africa

Deforestation drivers	Degradation drivers
Subsistence farming (39 %) Permanent and shifting cultivation (slash-and-burn) by local farmers	**Fuelwood collection and charcoal production (53 %)** For domestic and international markets
Commercial farming (35 %) Conversion of forests into industrial crops, pastures and industrial plantations, for domestic and international markets	**Forest exploitation (33 %)** Selective industrial and subsistence logging, legal and illegal
Mining (12 %) Surface mining	**Fire (7 %)** Uncontrolled fires (man-made)
Infrastructure development (12 %) Development of road and rail networks, and pipelines for hydroelectric dams	**Cattle grazing in woodland (7 %)** Small and large-scale
Urbanisation (2 %) Expansion of cities and villages	

Adapted from Hosonuma et al., 2012.

The primary drivers of deforestation and forest degradation are influenced by indirect secondary drivers, principally human population growth and associated factors such as increased demand for food and diets that include animal products, urbanisation and infrastructure development, increased demand for other raw materials and climate change (Figure 10). Guinean forests are also threatened by armed conflict, often exacerbated by high population density. This is the case in Nigeria, Sierra Leone, Liberia and Côte d'Ivoire, where pressures on biodiversity have been influenced by the dynamics of conflict and civil war. The impacts of these conflicts include a lack of respect for legislation, particularly concerning the management of natural resources and protected areas, and the displacement of large numbers of refugees who settle in uninhabited and inaccessible areas, creating or increasing pressure on resources, particularly fuelwood and bushmeat. On the other hand, in some cases, conflict situations limit the pressure on protected areas.
Forest degradation and deforestation impact not only the forest ecosystem in which they occur but also other ecosystems through the important ecological functions and ecosystem services provided by forests: limiting erosion, contributing to the water cycle, contributing to the carbon cycle, balancing the climate, etc.

In addition, the forests of West Africa contain several critical points where the risk of zoonoses emerging is particularly high. The identification of these critical points is based on the frequency with which epidemic diseases emerge. Unfortunately, the Ebola epidemics that occurred in the early 2000s, and more recently in 2014-2016, are a good illustration of this high risk of epidemics.

Illegally harvested bushmeat, Taï National Park, Côte d'Ivoire. (© M. Languy)

2.4.1 DEFORESTATION DRIVERS

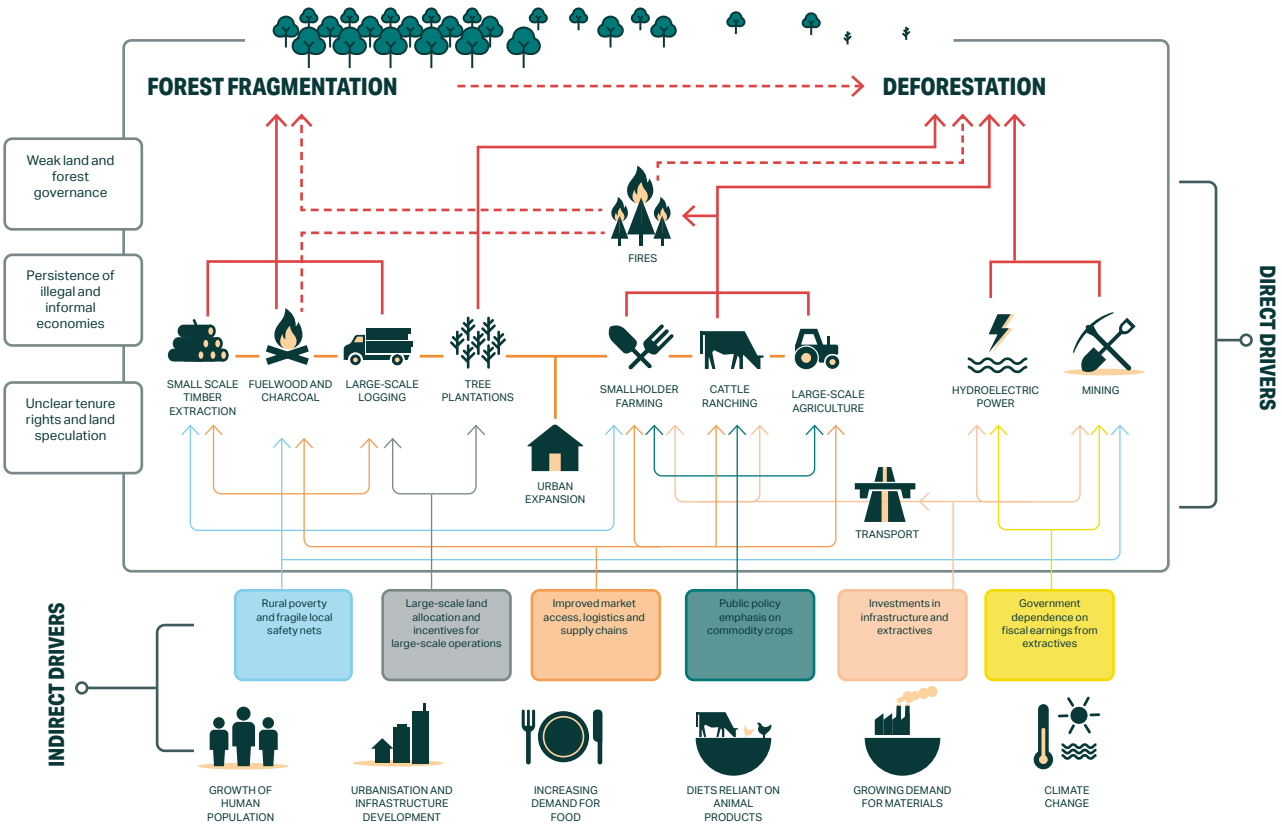
SUBSISTENCE FARMING

As in Asia, the main driver of deforestation in West Africa is the conversion of natural forests to agricultural land for subsistence farming, only slightly ahead of commercial farming. However, the contribution of subsistence agriculture to deforestation is increasing. In tropical rainforest areas, subsistence farming is traditionally carried out using the slash-and-burn method. This is a form of shifting cultivation in which the farmer clears a new patch of forest each year by felling the largest trees or girdling[6] them to induce their death, with the exception of certain individuals retained for the production of non-timber forest products (NTFPs) or for their sacred value. Small trees and understorey vegetation are cut down and destroyed by setting fire to the plot. This technique has the advantage of not requiring complex tools, just a machete and a hoe, and of being quicker than clearing by hand. In addition, burning the vegetation allows rapid mineralisation of the organic matter, which has a significant fertilising effect, albeit limited in the short term. Burning also limits competition from weeds in the first few years.

Clearing is carried out at the beginning of the dry season, and sowing at the beginning of the rainy season. Tillage is virtually non-existent, apart from the use of

6 Girdling: removal of a ring of bark around the entire circumference of the trunk, leading to the disruption of sap circulation and the slow death of the tree.

FIGURE 10 Conceptual diagram of the primary causes and secondary factors of deforestation



Source : Pacheco et al., 2021.

mounds or ridges for certain tuber crops. Traditional fields in West Africa are often planted collectively, thus providing a varied diet for the household: cereals (maize, rice, millet), tubers (cassava, yam, taro, sweet potato), plantain bananas, crops that provide fats (groundnuts, oil palms), vegetables (various squashes, aubergines) and condiments (chilli pepper). Monocultures do exist but are less common. It is estimated that beyond 25 to 30 inhabitants per km², slash-and-burn agriculture is no longer a sustainable system.

Depending on the crop, the plot is cultivated for 1 to 5 years (usually 1 to 3). Over the years, soil fertility declines and weed pressure increases, resulting in unsatisfactory yields. The plot is then left to lie fallow for several years. Initially, the fallow period was long (up to 30 or even 50 years) and enabled soil fertility to be reconstituted. However, the growth of the human population has led to a significant increase in demand for agricultural land and therefore a reduction in fallow periods. The forest vegetation then no longer has time to recover, the soil is not fully restored, and the balance between agricultural and forest areas is upset: new forest areas are converted into agricultural plots every year, leading to deforestation and soil degradation.

An example of slash-and-burn agriculture, Gba Community Forest, Liberia. (© M. Languy)

Subsistence farming is a major driver of deforestation in the West African forest region. Its influence is particularly marked in the lowland forests of the western Gulf of Guinea, the forests of eastern Guinea, the forests of the Niger lowlands, the Cross-Niger transition forests and in the Cross-Sanaga-Bioko coastal forests. This deforestation is often preceded by the opening up of the forest environment and the facilitation of its accessibility by logging or mining activities.

Despite the ban on cultivation in strictly protected areas, there are many examples of encroachment on these areas for agricultural plots, notably in the classified forests of Soyah, Pinselli and the Sabouyah reserve in Guinea, as well as at the foot of the Nimba massif.

COMMERCIAL AND INDUSTRIAL FARMING

In areas that were originally forested and where slash-and-burn agriculture was traditionally practised, large plantations for cash crops were established in West Africa during the colonial era to supply the colonising countries with tropical products. Today, these large-scale plantations are still often managed by foreign-owned industries, although in some cases cash crops are grown on small farmers' plots, which are then sold to intermediaries before being exported. The purpose of these plantations is not self-consumption within the household or local commercialisation, but international commercialisation. Most of the time, production only takes place in southern countries, while processing and most consumption takes

Rubber harvesting in Côte d'Ivoire. (© B. Haurez)

place in northern countries. The example of Côte d'Ivoire and cocoa farming is typical of the development of cash-crop plantations. The crops concerned are palm oil, rubber (hevea), cocoa, coffee, sugar cane, pineapple, sweet bananas, etc.

The large industrial plantations, which often cover several thousand hectares, are surrounded by packaging and sometimes primary processing facilities. They are located in regions with favourable soil and climate conditions, leading to the creation of specialised production basins. Chemical inputs and equipment are used extensively, often imported from northern countries. Sometimes, food for the workers' (and managers') camps is also imported from western countries. The workforce is linked to local workers who often live in camps with their families, veritable cities in the middle of plantations. The means of production are available and consumed in large quantities. Generally speaking, products are not processed much locally and are exported. Added value is therefore concentrated in the countries that own the companies' capital or import the raw materials.

In small farmer plantation systems, with a limited surface area (generally from 1 to a maximum of 10 hectares), the workforce is essentially family-based. In the case of perennial plantations, food crops (sweet bananas and especially plantains, cassava, taro, pineapple, etc.) are grown during the unproductive planting period, and sometimes beyond. The means of production are more limited, although organisation into cooperatives, associations or producer groups can facilitate access to inputs (fertilisers, plant protection products, seeds, tools and equipment).

Drying cocoa under the sun, carried out by local communities on the outskirts of the Grebo-Krahn National Park, Liberia. (© M. Languy)

Demand for tropical crops for the agro-industry is growing rapidly, in line with human population growth and rising living standards in emerging countries, particularly in Asia (especially for luxury products such as cocoa). In addition to the deforestation directly linked to the establishment of plantations, large industrial plantations have indirect impacts on the environment: intensive use of inputs (pesticides, mineral fertilisers), high water consumption, and sometimes contamination of water with chemical or biological products (rubber processing). Other effects include soil erosion, a drastic reduction in biodiversity, and large concentrations of artificially settled human populations in often isolated locations, leading in particular to high demand for bushmeat and increased hunting pressure.

Commercial and industrial farming is a threat that is greatly felt around the lowland forests of the Gulf of Guinea, in Côte d'Ivoire and in Liberia, notably around the Taï – Grebo-Krahn – Sapo landscape.

Cacao

Cocoa is produced from the seeds of the cacao tree (*Theobroma cacao*, Malvaceaea), which are fermented to develop their flavour and then dried. It is only after these two transformations that the product is considered a 'cocoa bean'. The cocoa tree was introduced to West Africa by Spanish colonists in the 1870s, making it today the world's main cocoa-producing region, responsible for around 60-75 % of the world's cocoa beans.

Cocoa beans are used to produce cocoa solids and cocoa butter, both of which are used to make chocolate. Other

TABLE 13 Ranking of countries by cocoa production (in tonnes)

Global rank in 2020	Country	Cocoa production (t)			
		1961	1980	2000	2020
1	Côte d'Ivoire	85 000	417 222	1 401 101	2 200 000
2	Ghana	415 200	277 200	436 600	800 000
4	Nigeria	197 000	153 000	338 000	340 163
8	Sierra Leone	2 840	8 497	12 000	193 156
18	Liberia	670	3 709	3 100	14 000
21	Guinea	1 500	4 000	3 300	12 000
Total production of the forest countries of West Africa		702 210	863 628	2 194 101	3 559 319

Source: 'Cacao (beans)', FAOSTAT, Food and Agriculture Organisation (FAO), UN. - https://atlasocio.com/classements/economie/agriculture/classement-etats-par-production-cacao-feves-monde.php

uses for cocoa include confectionery, biscuits, cakes and other food products.

Cocoa production has risen sharply, from 1 670 million tonnes in 1980 to 5 760 million tonnes in 2020, in response to growing demand that reflects both global population growth and rising living standards in some emerging countries, which are leading to increased consumption of chocolate and other cocoa-based products. This increase in production is linked to a proportional expansion in the area under cocoa cultivation, which has risen from 58 000 km² to 126 000 km² over the same period.

Most cocoa in the region is grown on small plantations (1 to 10 hectares) on family farms. It is the producers themselves who carry out the first processing operations, fermentation and drying, either on their own premises or collectively via cooperatives. Fermentation and drying centres are being increasingly developed in order to control the conditions under which these operations are carried out, as they have a major impact on the quality of cocoa beans.

Côte d'Ivoire is by far the world's leading cocoa producer (35 % to 45 % of world production, depending on the year), and this high level of production has been at the expense of the forest, with 80 % of the country's forest cover lost to conversion to cocoa plantations between 1960 and 2021. The situation is similar in Ghana, where 80 % of forest cover has been destroyed over the last 60 years, and at least a third of this deforestation is attributable to cocoa plantations. Although this tree originated in the understorey of the Amazonian forests, it is mainly grown as a monoculture in 'full sun' conditions, which are the most

↑
A cocoa pod. (© M. Languy)

productive in the short term. What's more, the Mercedes variety favoured in West African plantations has been specifically bred to adapt to growing in full sun. In these full-sun systems, which were favoured by the colonists, the plantation is destroyed after 15 to 20 years. Despite their classification as protected areas or classified forests, many of Côte d'Ivoire's forest massifs are gradually being nibbled away by the installation of small cocoa plantations, first on the outskirts, then deeper and deeper into the forest.

Globally, conversion to cocoa production led to the loss of 23 000 km² of forest between 2001 and 2015, or around 1 600 km² each year. Since 2010, deforestation linked to cocoa production appears to have increased sharply. Across West Africa, cocoa is the cash crop that contributes most to deforestation. Between 2001 and 2015, it caused a loss of between 0.01 % and more than 10 % of forest cover (depending on the localities concerned) in Guinea, Sierra Leone, Liberia, Côte d'Ivoire and Ghana.

Aside from the environmental impacts of cocoa tree cultivation, various social issues are also associated with it, such as the establishment and guarantee of a decent income for producers, combating child labour, and ensuring that large companies respect basic trade union rights.

← *Chocolate made from sustainably harvested cocoa. (© M. Languy).*

→ *This nursery was built and the nurseryman trained as part of the People, planet and cocoa project, Côte d'Ivoire. (© J.-L. Doucet)*

SIDEBAR 2 INITIATIVES FOR A GREENER CHOCOLATE

In recent years, a number of projects have been set up to change cocoa-growing practices and move towards more environmentally friendly systems. One way of doing this is through agroforestry, which involves growing cocoa trees in association with other woody species, thereby diversifying the production, limiting the use of inputs and extending the life of the plantations. Some complex agroforestry systems, such as those found in Cameroon and South America, have very high plant diversity, a structure similar to that of a natural forest, and can produce cocoa for between 40 and 80 years.

Several organisations aim to certify tropical agricultural commodities (Fairtrade and Rainforest Alliance) for socially responsible and environmentally sustainable production. The Cocoa and Forests Initiative (CFI) is a public-private partnership developed by Ghana and Côte d'Ivoire in 2017 to halt the deforestation associated with cocoa farming in West Africa. The actions implemented within this framework include supporting the development of agroforestry practices by distributing seedlings, contributing to the traceability of cocoa, training cocoa farmers in good agricultural practices, and setting up rural savings groups to facilitate access to credit and investments.

In addition, various initiatives from European countries also aim to guarantee that the chocolate produced, sold and consumed in these countries is not associated with deforestation, does not involve child labour and enables producers to live above the poverty line. They have been launched in France, the Netherlands and Switzerland and bring together certification labels, representatives of the chocolate sector (traders and producers) and supermarkets, social and environmental NGOs, research institutions and representatives of the public sector. At the time of writing, however, it has not yet been possible to assess the expected impact of these initiatives.

An example of a concrete initiative in the field is the 'People, planet and cocoa' project. Spearheaded by the Belgian chocolate maker Galler, with funding from the Roi Baudouin Foundation, People, planet and cocoa is a partnership begun in 2019 with the Fairtrade Belgium association, the Ivorian cooperative Yeyasso, the No Nonsense Marketing office, the

University of Nangui Abrogoua (Côte d'Ivoire) and Gembloux Agro-Bio Tech (GxABT, University of Liege).

The project involves three actions:
I. The implementation of agroforestry practices on the cooperative's cocoa plantations;
II. Reinforcing the socioeconomic role of women;
III. Improving the incomes of producers with a view to achieving a 'living wage'.

Barbara Haurez (GxABT) and Jean-Louis Doucet (GxABT), who were responsible for the agroforestry activities, contributed their scientific and technical expertise over the 3 years of the project. Using a participatory approach, they identified the technical itineraries best suited to the local context, selected the most interesting native agroforestry species on the basis of their multi-purpose values (production of timber, fuelwood, NTFPs, soil fertilisation, etc.), and trained the project's partner producers in agroforestry techniques and nursery management on the ground.

Over these 3 years, they have enabled 1 218 growers to receive more than 60 000 seedlings of 21 tree species, covering an area of almost 2 000 ha.

As a continuation of this project, Edouard Coenraets (GxABT) and Jean-Louis Doucet are returning to the field in 2024 for a further 3 years to measure the ecological and climatic benefits of the transition to agroforestry. They will be estimating the carbon sequestered in the trees and in the soil, by setting up growth monitoring systems on a sample of 200 ha.

SIDEBAR 3 WITH COCOA, A NEW 'PIONEER FRONT' THREATENING LIBERIA'S FOREST

More than a century after its introduction to Côte d'Ivoire, cocoa has become the most popular cash crop in the country's 'forested' south, for ecological (rainfall), agronomic (good initial fertility and forest undergrowth, then with varieties considered to be sun-resistant) and economic reasons. As a result of population growth and the gradual ageing of the orchards, cultivation has gradually moved from the country's eastern side of the centre to the west of the centre and the southwest – successive 'cocoa development fronts' – with extensive cultivation methods, enabling land ownership that has been based for a long time on the concept that 'the land belongs to the person who works it'. The populations of the country's central and northern regions, which were unfavourable for cocoa farming, were encouraged to migrate to the sparsely populated forest regions. In order to expand their crops, producers often called on outside human resources, thereby encouraging migratory movements that have increased with the economic difficulties and the climate, and now security, crises experienced in the Sudano-Sahelian regions of West Africa.

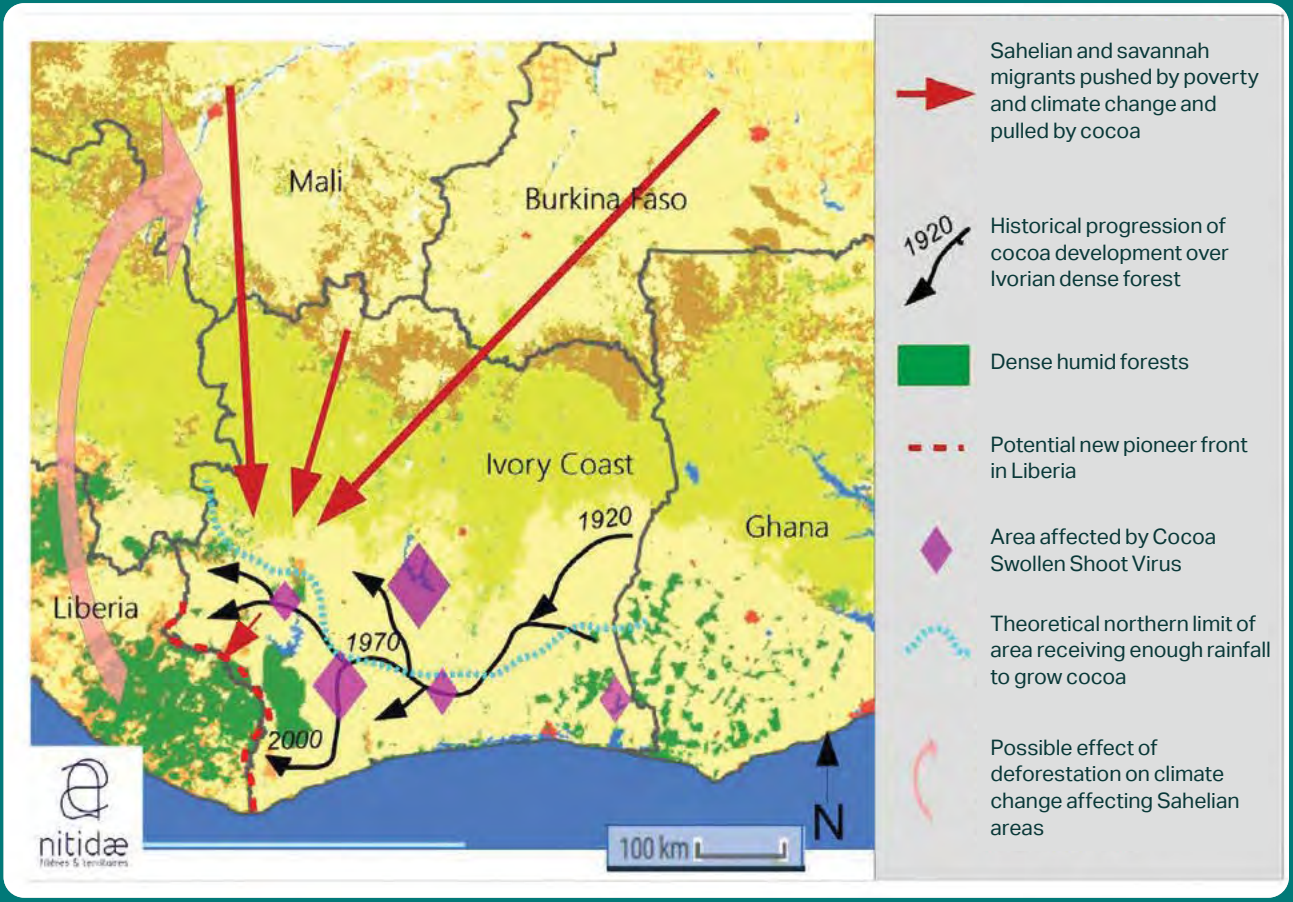
The land pressure on rural areas has not spared the classified forests and certain protected areas, which were poorly defended at the time, leading the country through a period of intense deforestation and towards an excessive loss of forest cover, despite the fact that this cover guarantees favourable agro-ecological conditions (less than 3 million ha of forest in Côte d'Ivoire in 2023). The 2011-2012 crisis exacerbated this trend, leading authorities and stakeholders to become more aware of the need to protect forests (see *the Strategy for Preservation, Rehabilitation and Extension of Forests*, SPREF, of the Ministry of Water and Forests, 2019), even deciding, as in the Mont Péko National Park, to evict illegal occupants. To ensure their preservation, some classified forests that are still well preserved have had their status upgraded to 'nature reserves' (such as Mabi-Yaya in 2019, Bossématié in 2022, Cavally in 2023, etc.).

This new attitude in Côte d'Ivoire has put the migrants who had invested in these massifs back in exodus, adding to the continuous flow of new arrivals, all in search of available land. As a result, land-seekers have crossed the Cavally to Liberia, which is still 'forested' and sparsely populated. Since the mid-2010s, initiatives have been undertaken, although the administrative authorities have not given them a favourable reception, with some planters even being imprisoned for illegal clearing. Local communities have also shown a marked reluctance towards newcomers, rejecting the idea of formal land sales.

Nevertheless, as the indigenous communities are all cross-border (Guéré and Krahn between Taï and Ziah Town; Kroumen and Grebo between Djouroutou and Youbor), common origins and links of kinship and solidarity encourage intermediation between villagers, in search of labour to develop their own activities, and migrants, in search of work and land to cultivate. The current situation is very similar to that of the development of an agricultural economy in the past in the southwest of Côte d'Ivoire. Indeed, we are witnessing a repetition of the previously lived scenario, where natives later denied having 'sold' their land to migrants. While major socio-political consequences are foreseeable in the short to medium term, so too are impacts in terms of the environment and development, with, on the one hand, a significant risk of the transfer of unsustainable cocoa-growing practices and, on the other, a risk of uncontrolled deforestation that could, ultimately, threaten protected areas and connectivity zones in the TGKS landscape.

As early as 2021, these concerns were taken into account by the European Union and the European Forest Institute (EFI) in their preparations for a policy dialogue between the EU and West Africa on sustainable cocoa farming. And, in April 2023, the European Parliament voted in favour of the European Union Deforestation Regulation (EUDR), which requires companies registered in EU Member States to ensure that the cocoa they import or export has not been produced on deforested land after 31 December 2020 and that it complies with the legislation of the country of production. It is vital that Liberia is involved in this political dialogue, which at present involves Côte d'Ivoire, Ghana and Cameroon, along with the EU. The issue of a new 'cocoa pioneer front' in Liberia has been documented by the EU's REDD (Reducing emissions from deforestation and forest degradation) Facility in its studies *Sustainability initiatives in Ivorian and Ghanaian cocoa supply chains: benchmarking and analysis* (EFI & Nitidae, 2021). The map below illustrates the historical progression of cocoa westwards.

FIGURE 11 The westward progression of cocoa: a new pioneer front in Liberia? Sources: Base map from ESA CCI Land cover website (2018); symbols and trends from Nitidae, 2021.

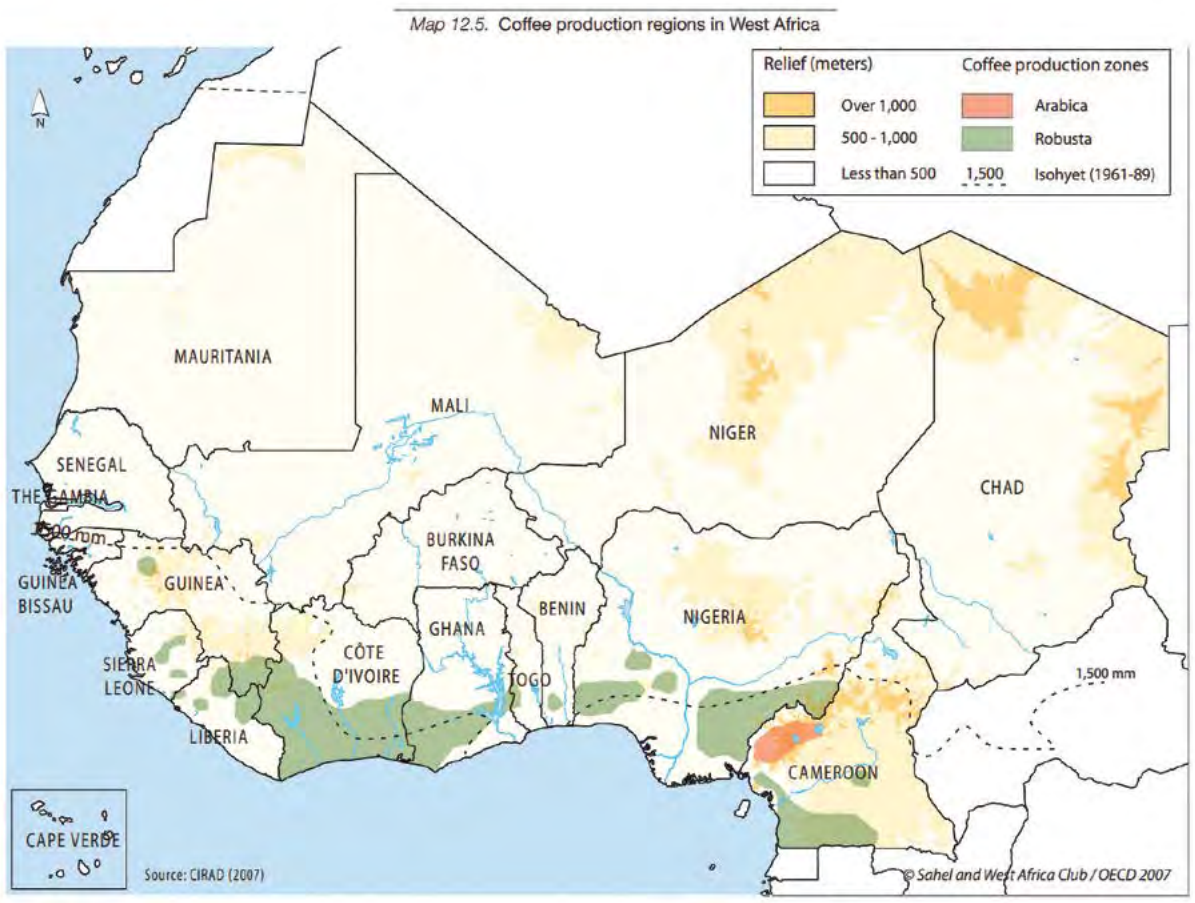


In May 2023, a regional workshop on 'Cocoa and forest coexistence in West Africa' brought together nearly 100 participants in Monrovia under the aegis of a joint initiative between the EU-funded support programme for the preservation of forest ecosystems in West Africa (PAPFor) and USAID's West Africa Biodiversity and Low Emissions Development Program (WABiLED). According to a 'call to action' available in the workshop proceedings (WABiLED & PAPFor), the key recommendations are as follows:

- Limiting the potential negative impacts of cocoa farming, by respecting the permanent forests of the state or communities; the tools to be used are traceability, respect for the law (reinforced patrols, particularly at the border) and the implementation of landscape management (land-use planning and good governance for natural resources);
- Promoting good agricultural practices (GAP), with shade management (30 to 40 % cover) through agroforestry, fertility management with appropriate fertilisers and legumes, use of high-yielding varieties and the valorisation of NTFPs;
- Plan, manage and control migratory flows as far as possible, a difficult task because of the ECOWAS regulations (to which the countries concerned belong) on the free movement of people within its area;
- Implementing the new European regulation in Liberia, as well as the ARS 1000 standard recently validated for Côte d'Ivoire.[1]

1

FIGURE 12 Main coffee production basins in West Africa



Source: Sahel and West Africa Club (OECD/SWAC), 2007.

Coffee

Coffee is produced from the seeds of two species of the Rubiaceae family: the arabica coffee tree (*Coffea arabica*) and the robusta coffee tree (*Coffea canephora*). The arabica coffee tree originates from the plateaus of Ethiopia and is adapted to growing at altitudes (1 200 to 1 500 m). It accounts for the majority of production (around 70 %) and is considered to have a better-quality aroma. Robusta coffee comes from West Africa (Guinea and Liberia) and is grown at low altitudes (below 1 000 m). More vigorous and productive, this species is the most widely grown in West Africa (Figure 12).

As with cocoa, coffee production is concentrated in tropical regions, while the majority of consumption takes place in Europe. North America is the third region in terms of consumption, after Asia and Oceania (taken together) in second place. While Africa was a major coffee-producing region before 1960 (20-25 % of production), it now only contributes 14 % of world production. West Africa, where coffee production is declining, accounts for a third of Africa's production, most of which is robusta coffee.

TABLE 14 Ranking of countries by production of green coffee (in tonnes)

Global rank in 2020	Country	Green coffee production (t)			
		1961	1980	2000	2020
18	Côte d'Ivoire	185 500	249 609	380 000	59 412
22	Guinea	15 000	14 400	22 080	38 572
50	Sierra Leone	5 103	10 146	15 000	2 400
52	Nigeria	1 100	3 500	3 830	1 887
54	Ghana	1 700	1 500	1 956	736
55	Liberia	3 400	12 742	3 127	638
Total production of the forest countries of West Africa		211 803	291 897	425 993	103 645

Source : Coffee (green), FAOSTAT, FAO, UN – https://atlasocio.com/classements/economie/agriculture/classement-etats-par-production-cafe-vert-monde.php

Commercialised coffee beans are produced by removing the pulp and hulling the fruit of the coffee tree (the 'cherries'), then roasting the beans at 180-220 °C.

Most of the world's coffee is produced on small family farms (generally less than 10 hectares), which are often also involved in cocoa production. Producers are often members of cooperatives. Drying and hulling are carried out by the producers themselves or by the cooperative, which then sells to an intermediary.

On a global scale, the development of coffee plantations was responsible for the loss of 19 000 km² of forest between 2001 and 2015, a loss of around 1 400 km² per year over this period, and the area of forest converted to coffee plantations is increasing. Although it has less impact than cocoa cultivation in the forested countries of West Africa, coffee production is a major factor in deforestation in Guinea, Sierra Leone, Liberia and Côte d'Ivoire. In these countries, between 0.01 and 2 % of forest cover was replaced by coffee plantations between 2001 and 2015.

Coffee 'cherries' growing on a coffee tree in Mount Nimba Nature Reserve, Guinea. (© M. Languy)

TABLE 15 Ranking of countries by palm oil production

Global production rank in 2023	Country	Production (in 1000 tonnes)				Import (in tonnes)
		1965	1980	2000	2023 (estimation)	2023 (estimation)
5	Nigeria	517	520	730	1 400	475
8	Côte d'Ivoire	15	147	248	600	70
14	Ghana	14	19	108	300	300
20	Sierra Leone	40	50	36	75	10
24	Guinée	13	40	50	50	95
25	Liberia	16	28	42	45	40
Total production of the forest countries of West Africa		615	804	1 214	2 470	990
Global demand			73 030	77 220		

Source: Index Mundi - Adapted from https://www.indexmundi.com/agriculture/?commodity=palm-oil&graph=production

Palm oil

The oil palm (*Elaeis guineensis*, Arecaceae) is one of the few cash crops native to Africa (along with coffee). It is grown to produce two products: (i) palm oil, which is extracted from the orange pulp of the fruit by hot pressing, and (ii) the less well-known palm kernel oil, which is extracted from the kernel of the fruit. As well as being used extensively in the agro-industry, palm oil is the main source of fat in Central and West Africa, and sometimes makes up a significant proportion of the calorie intake in rural areas. Its importance is also linked to the large number of small-scale producers involved in oil palm cultivation.

Southeast Asia produces the vast majority of palm oil. However, all the Guinean countries produce palm oil, and some – Nigeria, Côte d'Ivoire and Ghana – are major producers in Africa as a whole. Unlike palm oil produced in Asia, African production is essentially for local consumption. However, current production (less than 5 % of world production) does not meet local demand (Table 15), and the growth in the human population coupled with urbanisation in West Africa point to a sharp increase in demand for palm oil in the region.

Palm oil accounts for around a third of the vegetable oil consumed worldwide. Global demand for vegetable oils is proportional to human population growth, more than doubling between 2000 (90.5 million tonnes) and 2022 (209 million tonnes). By 2050, it is predicted that global demand for vegetable oils will be 50 % higher than in 2019 (i.e. almost 300 million tonnes). To this projection must also be added non-food demand, particularly the production of biofuels. Meeting the demand for palm oil will partly require an increase in yields, but it will also be essential to expand plantations, particularly in Africa, and to cultivate other ecosystems such as savannahs.

In Africa, red palm oil, traditionally used as an edible oil for cooking and frying, is widely available. However, this use is not possible in temperate countries because the oil

Bunches of oil-palm fruits, Mount Nimba Nature Reserve, Guinea. (© M. Languy)

solidifies at lower temperatures. Palm oil is used there as a major ingredient in processed food products, replacing animal fats and other vegetable oils whose cost price is much higher. With yields of 2.5 to 7 tonnes of oil per hectare[7], the oil palm stands out as the most productive oilseed crop. Other non-food industrial uses have been developing over the last 50 years or so in cosmetics and soap making, and for the manufacture of synthetic rubber, lubricants, emulsifiers, aromatic products, etc. Palm oil could be used as a fuel, but the development of this use clashes with other, more profitable uses for the product.

Palm kernel oil is mainly used in animal feed and in the cosmetics industry, although it can be used for the same purposes as palm oil.

Palm plantations are established by felling and completely clearing the plantation area, and planting a monoculture of palms generally accompanied by a cover plant (legumes of the *Mucuna* and/or *Prueraria* genera) to contribute to the supply of nitrogen by symbiotic fixation, and to limit the pressure of weeds and the risks of erosion. Production generally starts around 3 years after planting and reaches its peak after 10 years. It maintains this level of production for around 25 years before the reduction in yields and the challenges of harvesting mature trees become prohibitive. At this point, the plantation is destroyed by felling the palms, left to lie fallow, then replaced after several years by a new plantation, or abandoned altogether.

The establishment of oil palm plantations is a major factor in deforestation in tropical regions, especially in Southeast Asia, where the majority of production comes from. Between 2001 and 2015, palm plantations led to the deforestation of 105 000 km² of forest worldwide, an average of 7 500 km² per year. Since 2009, the rate of deforestation associated with oil palm cultivation seems to have fallen, mainly as a result of environmental considerations and the development of a 'zero deforestation' policy, but the situation remains alarming. In West Africa, oil palm cultivation is concentrated mainly along the coasts of Liberia, Côte d'Ivoire and Ghana. In this region, it is estimated that 3 % of deforestation between 1975 and 2015 was due to conversion to palm groves, so the majority of oil palm plantations would have been established on other crops or other shrub formations.

In addition to deforestation, oil palm cultivation has a number of environmental impacts: a drastic reduction in biodiversity, pollution linked to the use of chemical products (fertilisers, phytosanitary products, products used for processing), water contamination, production of waste, CO_2 emissions from the operation of the plant, etc. However, there are also positive social impacts, such as the construction of health and education infrastructures, access to drinking water and electricity, and job creation.

7 Yields for other oilseed crops are much lower: around 0.8 t/ha for rapeseed, 0.7 t/ha for sunflower and 0.5 t/ha for soya.

SIDEBAR 4 TOWARDS SUSTAINABLE OIL PALM PRODUCTION

In response to the environmental and social issues raised by palm oil cultivation, the Roundtable on Sustainable Oil Palm (RSPO) was set up in 2004 to establish criteria for sustainable palm oil production. The RSPO is a not-for-profit organisation that brings together stakeholders from across the industry: palm oil producers, processors and traders, major retailers, banks and investors, as well as conservation, environmental and development NGOs.

The criteria defined are organised into three objectives: economic (a competitive, resilient and sustainable sector), social (sustainable well-being and poverty reduction) and environmental (ecosystems conserved, protected and improved for the next generation). In environmental terms, the main objectives are to halt the deforestation associated with palm oil production, and to protect wildlife and the environment.

However, the RSPO label has been criticised by a number of major environmental NGOs, which have strongly questioned the results obtained, particularly the fact that plantations can be established in place of secondary forests. The involvement of the industry's economic players in the initiative, who in this way become both judge and judged, is also being questioned.

Rubber

Natural rubber is mainly derived from the latex of the *Hevea brasiliensis* tree (Euphorbiaceae), native to South America. Other plant species produce rubber[8], but their production and use is marginal compared with rubber from the hevea tree. Natural rubber is used in competition with synthetic rubber, which is chemically produced from petroleum by-products, and its demand fluctuates according to the price of oil on the world market. Some uses, however, are not possible with synthetic rubber, such as surgical gloves and condoms. Natural rubber from hevea trees accounts for around 47 % of the world elastomer market.

Around 6 % of global production comes from Africa, and 90 % from Asia. The leading producer in West Africa (which is also the leading producer in Africa) is Côte d'Ivoire, which is also showing strong growth in its production, quadrupling in the space of 20 years.

Production of natural rubber from hevea trees almost tripled between 1994 (5 800 tonnes) and 2021 (14 000 tonnes), with a similar increase in the total area of plantations. Natural rubber production has developed almost in parallel with synthetic rubber production, apart from a drop in synthetic rubber production in 2009, linked to the oil crisis. Given the development of industries, global demand continues to rise and is projected to reach 19 million tonnes in 2025.

Rubber is used in the manufacture of tyres (around 75 % of its use), shock absorbers and belts, cable sheaths, seals, elastics, floor coverings, soles, surgical protection

8 Two plants in the Asteraceae family are involved: guayule (*Parthenium argentatum*), a shrub from the semi-arid regions of Mexico and the southern USA that can be grown in Mediterranean climates; and Russian dandelion (*Taraxacum kok-saghyz*), which can be grown as an annual in temperate climates.

TABLE 16 Ranking of countries by natural rubber production (in tonnes)

Global rank in 2020	Country	Natural rubber production (tonnes)			
		1961	1980	2000	2020
5	Côte d'Ivoire	82	21 626	123 398	936 061
14	Nigeria	58 000	45 000	107 000	148 435
17	Liberia	41 205	81 400	105 000	64 878
18	Ghana	415	11 200	8 700	50 400
23	Guinée	-	-	7 000	14 950
Total production of the forest countries of West Africa		99 702	159 226	351 098	1 214 724
Global demand		2 120 000	3 860 000	7 580 000	15 530 000

Source: Rubber (natural), FAOSTAT, FAO, UN. Adapted from https://atlasocio.com/classements/economie/agriculture/classement-etats-par-production-caoutchouc-naturel-monde.php

products, food preservatives, etc. Its physicochemical properties, which have not yet been fully replicated with synthetic rubber, make it a strategic material still preferred for the manufacture of tyres, latex, technical rubbers and footwear. As mentioned above, it remains the only rubber that can be used for certain purposes (aircraft tyres, surgical gloves and condoms).

As with palm oil, rubber is produced on two types of plantations: (i) small plantations managed by farmers, who are in the majority and produce around 80 % of hevea rubber, and (ii) large industrial plantations associated with primary processing plants. The ecological conditions for growing rubber are similar to those for growing oil palm, and both types of plantation are found in the same regions. The plantation is set up after the plot has been felled and cleared, and the seedlings are produced in a nursery from cuttings taken from timber yards. Although this crop is less controversial than oil palm, the development of rubber cultivation has also contributed to the conversion of forests to rubber monocultures. To limit the expansion of plantations, it is necessary to improve yields and intensify production. To that end, genomic selection research is currently underway to produce more productive trees. On the other hand, rubber is a material that is currently little recycled, and advances in this area could both meet demand and address environmental issues linked to waste, especially from used tyres.

Other impacts of rubber production on the environment are the very high consumption of water for processing (around 20 m^3 of water per tonne of dry rubber produced) and the release of this water that is highly charged with organic matter, which must be treated. A number of chemical products are also used to process rubber latex: phosphoric acid, acetic acid, lime, caustic soda, and water treatment products like aluminium sulphate, lime, soda, and sodium or calcium hypochlorite.

SIDEBAR 5 'ZERO DEFORESTATION' RUBBER

A similar initiative to the RSPO exists for the sustainable production of natural rubber from hevea trees: the Global Platform on Sustainable Natural Rubber (GPSNR). Officially launched in 2018, this international organisation brings together producers, processors and traders of rubber, tyre manufacturers and other buyers of natural rubber, representatives of downstream industrial users of the sector (such as car manufacturers), representatives of financial institutions, civil society organisations and representatives of small-scale producers.

The GPSNR sets out the criteria for achieving financial, social and economic sustainability. The organisation's objectives include the production of 'zero deforestation' natural rubber, an end to the burning of plots of land before plantations are set up, and a guarantee of fair wages for producers. Non-binding best practice manuals on plant production, setting up and running a plantation, harvesting, and managing pests and diseases have also been drawn up to guide growers.

The criticisms levelled at the GPSNR are similar to those levelled at the RSPO, i.e. a label with little independence, awarded by the industry players themselves, who account for over 50 % of its members.

Local hevea plantation and rubber harvesting in Côte d'Ivoire. (© B. Haurez)

Road and industrial plantation, Greenville region, Liberia. (© M. Languy)

Other cash crops
Although of lesser importance, other large-scale international trade crops are grown in West Africa: sugar cane, pineapple and banana.

The environmental impacts are similar to those already presented: deforestation to establish plantations, plus all the associated impacts, including a massive reduction in biodiversity, intensive use of chemicals, high water consumption and soil erosion.

The impact of cash crops on the forests of West Africa is almost as great as that of subsistence farming. The ecoregions most affected are the forests of eastern Guinea, where a large proportion of the forest has been converted to cocoa and coffee plantations, the forests of the Niger lowlands for oil palm, cocoa and rubber plantations, and the coastal forests of the Cross-Sanaga-Bioko with industrial plantations of oil palm, rubber and fast-growing trees for pulp production.

MINING

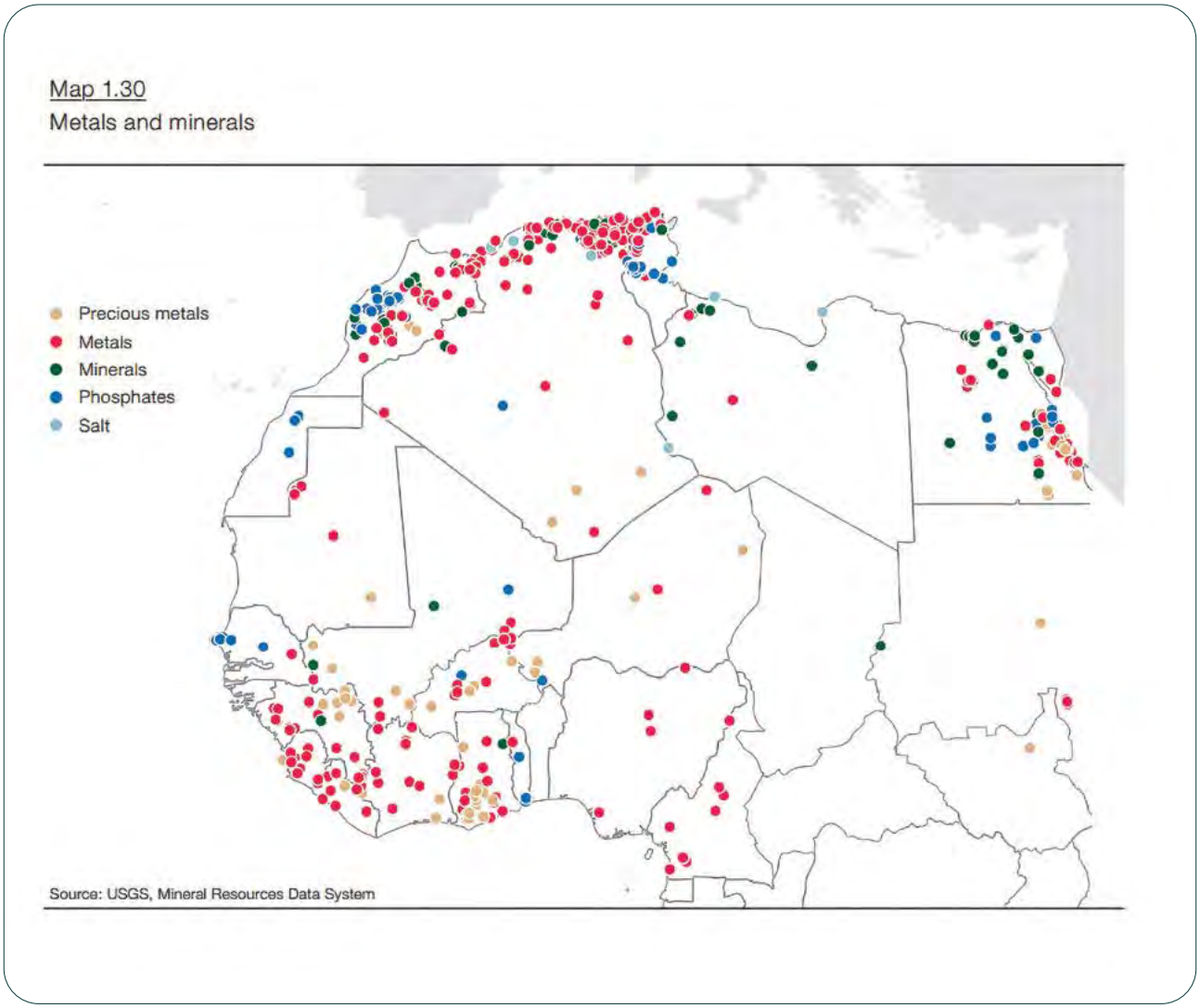
Mining is responsible for 12 % of deforestation in Africa, which hosts around 30 % of the world's mineral resources. In West Africa, these strategic resources for the global market, such as gold, diamonds, iron and bauxite, are often found in forested areas.

Several types of mining are practised in West Africa, with differing environmental impacts:

- **Artisanal mining**, mainly for gold and diamonds, sometimes heavy minerals (zircon, rutile) and, rarely, uranium. This sector is generally unstructured and informal, and most of the time illegal. It is a breeding ground for poaching.
- **Semi-industrial or 'small-scale mining' operations**, which include gold but also phosphate, heavy metals and semi-precious stones. They reflect national attempts to structure the informal artisanal mining sector. In Anglo-Saxon countries (Ghana, Liberia and Sierra Leone), artisanal and small-scale mining are generally grouped together under the term artisanal and small-scale mining (ASM).
- **Industrial mining**, which includes:
  - > precious stones and metals: in this case, the deposits that are mined have low ore content (1-5 %). They are processed on-site, so the excavated rock remains on-site. The substances concerned are gold, diamonds, uranium, rare earth[9] and associated metals (niobium, tantalum, lithium, etc.). For all these operations, virtually all the excavated rock and mining waste remains *in situ*. The low concentration of ores and their combined presence in deposits means that extraction, treatment and separation processes are necessary, and these are costly in terms of energy, water and chemicals. Large quantities of rock also have to be extracted to obtain small quantities of target elements.
  - > heavy metals, of high density, such as iron, bauxite[10] and manganese: their deposits contain high concentrations (several tens of per cent).

9 Rare earths refers to a group of elements with similar properties, atomic radii and geochemical behaviour, which are used in many fields of advanced technology, and for which demand is therefore increasing rapidly. Although they are abundant and relatively common in the earth's crust, their concentration is always low (hence the name) and they are found in association in deposits.
10 Bauxite is the principal element used in the production of aluminium.

FIGURE 13 Location of the main mining resources in North and West Africa.



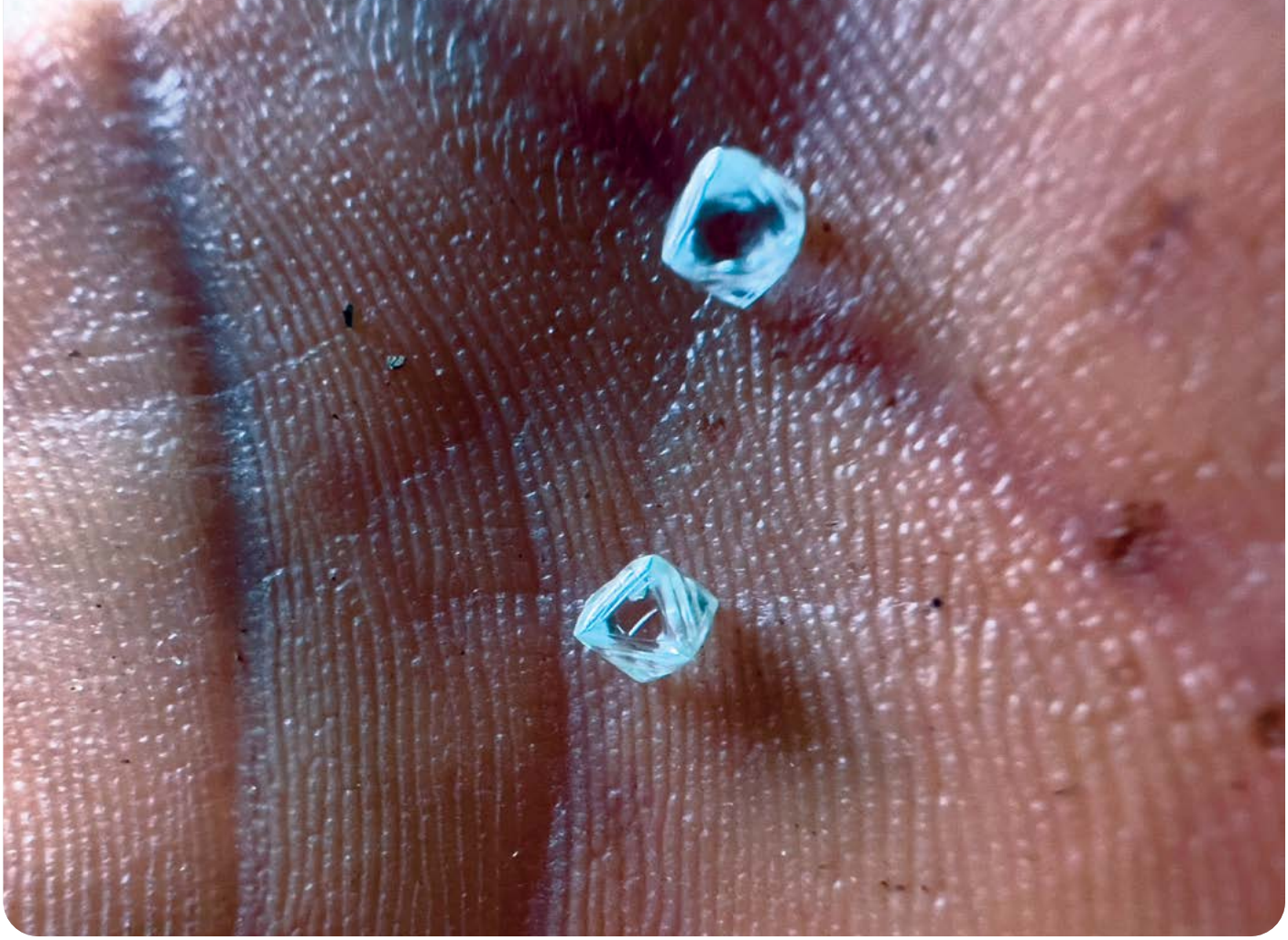
Source: Atlas of the Sahara-Sahel, OECD, 2014.

Rocks extracted from deposits are transported as they are (or after a slight enrichment on site) to a mining port for export, and more rarely to an industrial zone where they are processed. These operations therefore require extensive transport infrastructure, often leading to the construction of railways. The exploration and exploitation of these substances in West Africa are mainly carried out by international mining companies, with significant state involvement.

> other substances, mainly phosphate (either transported or processed on-site) or base metals (copper, lead, zinc). Deposits have intermediate concentrations, ranging from a few per cent to 20-30 %.

- In the **quarrying sector**, two types of materials can be distinguished: 'raw' materials (sand, gravel, crushed stone, ornamental rock, etc.) used without major processing, and materials requiring processing, such as gypsum (plaster) and limestone for cement.

The map in Figure 13 shows the location of the main mining resources in North and West Africa.



Diamonds extracted from Guinean forests.
(© F. & S. Pekus)

Artisanal mining

ASM is defined as mining that uses mainly simplified forms of exploration, extraction, processing and transport, along with manual labour with limited mechanisation. The tools traditionally used are drills, shovels and pickaxes. However, the use of chemicals, explosives, mechanical devices and metal detectors has recently increased significantly. These are generally not capital-intensive operations using labour-intensive technologies. In West Africa, this type of mining mainly concerns gold miners (artisanal gold mining) or diamond miners (artisanal diamond mining), although there are artisanal mining operations in other areas (river or beach sand, semi-precious stones, etc.).

This sector is largely informal but represents a major source of income for millions of people around the world. In 2004, between 4.5 and 6 million people were thought to be involved in the sector in Africa. The sector has grown considerably in recent years in West Africa, and there has been an increase in the misuse of chemical substances for mineral processing. Regulation of the sector is often inadequate, and it is difficult to estimate its real contribution to a country's economy. It is generally 'unprofessional' mining, with no respect for the rules of the art and no concern for the environment. When a gold mining site starts production, several hundred or even several thousand gold miners move into a previously uninhabited area. ASM sites are organised like large villages with customary authorities and sometimes well-established traditional rules.

West African countries are attempting to limit and regulate artisanal mining (gold and diamond mining), but these activities are still often carried out illegally in areas that are off-limits to exploitation, particularly in protected areas. Gold mining is by far the dominant illegal activity.

Railway wagons for the transport of bauxite ore, Guinea. (Igor Grochev / Shutterstock)

TABLE 17 Volume of rock excavated for various minerals and the surface area involved for a typical West African mine

Mineral	Annual excavated volume (Mt)	Total excavated volume (Mt)	Pit width (ha)	Volume of residues (Mt)
Gold	2-5	20-100	5-30	20-100
Iron and bauxite	10-20	500-1000	200-500	200-400
Phosphate	1-20	50-200	50-2000	20-100
Gravel quarry	0,2-0,6	<10	<10	No residues

Note: 1 megatonne (Mt) corresponds to approximately 0.4 million cubic metres (Mm^3)
Source : IUCN, 2012.

Industrial mining

With the exception of gold mines, which are operated partly underground, industrial mines in West Africa are open-pit mines. Setting up operations therefore requires clearing the area, building excavation pits and extracting significant volumes of rock (Table 17).

It is difficult to estimate the total contribution of mining to the economy and employment in West African countries, given the informal nature of most artisanal mining activities. As for industrial mining, the Extractive Industries Transparency Initiative (EITI) aims to make the sector transparent and regularly publishes data. There is a difference between the Upper Guinean countries, where mining makes a significant contribution to the economy, and the Lower Guinean countries, where oil and gas exploitation is more developed.

Mining poses a particular threat to certain ecoregions, because of their potential in terms of mineral resources: the Guinean highland forests (Liberian slopes of Mount Nimba), which contain large deposits of high-quality iron that provide a source of income for Liberia, and the lowland forests of the Gulf of Guinea in Sierra Leone for diamond, bauxite and titanium dioxide mining.

TABLE 18 Main minerals and contributions of the mining sector to the GDP of Guinean forest countries

	Main minerals	Contributions of the mining sector to GDP (%) (reference year)	Contribution to employment (%) (reference year)
Côte d'Ivoire[a]	Gold, granite, manganese, phosphate, nickel	6.32 (2020)	0.66 (2020)
Ghana	Gold, manganese, bauxite, diamond	7.6 (2020)	NC
Guinea	Bauxite, gold, gravel, iron, diamond	16.48 (2020)	6.10 (2020)
Liberia	Gold, diamond, iron	17 (2020)	NC
Nigeria	Gold, gravel and other minerals	0.45 (2020)	0.3 (2020)
Sierra Leone	Iron, diamond, bauxite, rutile, gold	1.2 (2021)	1.33 (2020)

a) For Côte d'Ivoire, the figures given correspond to the total for the extractive industries sector (mining, oil and gas).
b) NC = not communicated

Source: https://eiti.org/countries

SIDEBAR 6 THE IMPACT OF INDUSTRIAL MINING OPERATIONS ON PROTECTED AREAS: THE CASE OF THE NIMBA LANDSCAPE

Shared between Guinea, Côte d'Ivoire and Liberia, and with an altitudinal gradient of 400 to 1 750 m, the Mount Nimba landscape has a wide variety of habitats, from dense rainforest to montane grasslands. The landscape has great tourism potential and is a unique centre of endemism for many plants and animals – the Guinean and Ivorian sections are a UNESCO World Heritage Site. In addition to this unique conservation value, the landscape is also known as a mining landscape, with iron ore mining operations underway for decades on the Liberian side and in preparation on the Guinean side.

The impact of mining operations on the East Nimba Nature Reserve (Liberia)

The East Nimba Nature Reserve (ENNR) was created in 2003, but before it was classified it was heavily affected by iron ore mining, with operations carried out by Liberian-American-Swedish Mining Company (LAMCO) from 1963 until the mid-1980s. Large parts of the mountain were completely destroyed (excavation of the ground along the summits), the soil moved and the rivers polluted. These marks are still very visible and will remain so for several millennia. Although iron ore mining has ceased and no mining operations have taken place in recent decades, natural habitats (particularly sub-montane forests) have been lost and replaced by rocky ground dotted with short grasses. In addition, the artificial grassy areas are highly conducive to bushfires, severely limiting forest regeneration.

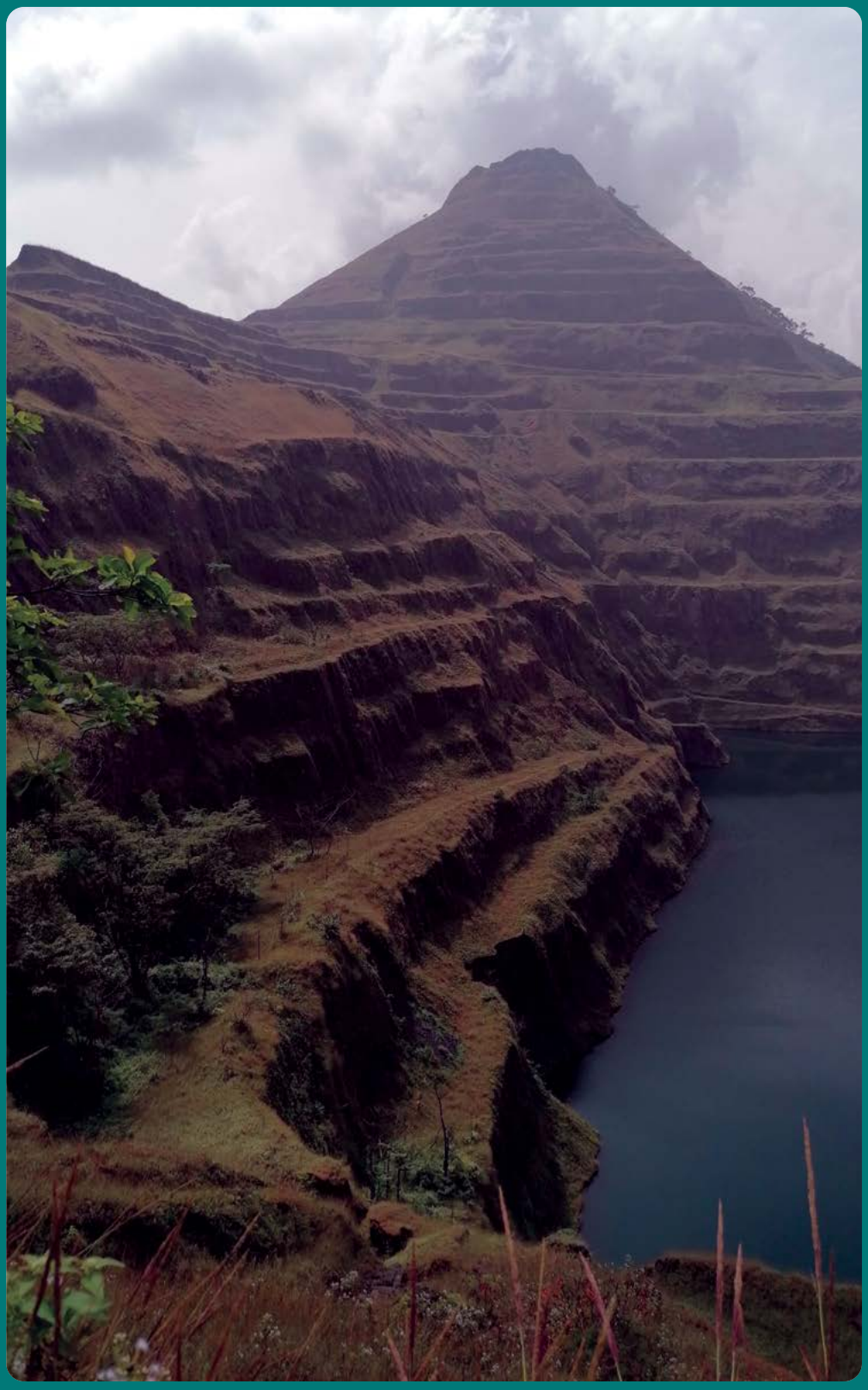
The ENNR is located within the mining concession operated by ArcelorMittal, a company that has some activities as an offset to other mining operations only a few kilometres from the reserve. In theory, this offers a significant funding opportunity for the ENNR. Unfortunately, the company's support is limited to a few meagre conservation support activities, which represent a tiny fraction (well under 1 %) of the profits made by ArcelorMittal: less than USD 200 000 pa and, moreover, provided in an irregular manner.

In addition, this same company wishes to take over the activities of another company in the Blei Community Forest, which is on the immediate border of the ENNR, and whose negative impact on the reserve will be significant, as a catchment area of the exploitation zone overlooks the ENNR. It is at this very spot, however, that species of butterflies new to science have just been described.

This situation contrasts sharply with the experience underway in Moyen Bafing in Guinea, where two mining companies, CLG and GAC, are funding the conservation of the Moyen-Bafing National Park to the tune of between USD 2 and 3 million pa, with a total of USD 16.4 million over the period 2018-2023 alone, more than 15 times what is being granted to the East Nimba Nature Reserve.

The threats of operations in Guinea

Several mining projects adjacent to the boundaries of the Mount Nimba Nature Reserve in Guinea pose a significant potential threat. For example, a mining concession of 1 550 ha has been excluded from the reserve (and is therefore not part of the World Heritage site) to allow iron ore to be mined. This concession held by Société des Mines de Fer de Guinée has been taken over by a new investor, High Power Exploration. Although this project, currently in the exploration phase, follows very strict environmental standards and is actively involved in protecting key conservation sites, with a convincing mitigation plan, it involves the complete stripping of part of the mountain ridge, removing millions of cubic metres of soil and leaving significant scars. Apart from the impact on biodiversity, such exploitation will have a huge negative impact on tourism, which is largely based on sightseeing. Another mining project, that of Zali Mining SA (formerly Western Africa Exploitation), is located in the buffer zone on the northwestern edge, in a savannah ecosystem that contributes to the diversity and ecological value of the Nimba Mountains.



Landscape impacted by mining activities in the East Nimba Nature Reserve, Liberia. (© M. Languy)

The mining of iron in the Nimba Mountains has left behind significant scars. This area was covered by a mature forest before its exploitation. East Nimba Nature Reserve, Liberia. (© M. Languy)

The environmental impacts of mining operations

The environmental impacts of mining operations are both direct and indirect. Direct impacts include deforestation associated with exploration drilling; habitat loss and erosion; the installation of the transport network (road and rail); infrastructure development; the construction of waste disposal sites; rock extraction; contamination of waterways and soil, and of the air by dust and smelter emissions; and the creation of artificial human concentrations. Mining also generates noise pollution and human activities that disturb or drive away animal populations.

Mining and mineral processing require large quantities of groundwater and/or surface water. This demand for water can lead to a scarcity of water resources, but it can also have an impact on the quality of freshwater systems and regional watersheds. When tailings from mining operations are discharged into the water following treatment, a high load of sediment is incorporated into the water, increasing its turbidity. By reducing the penetration of light into the water, turbidity limits the growth of aquatic plant and animal organisms, and encourages the development of microbes and pathogens. Some plant and animal species that are sensitive to reduced light have increased mortality rates. In addition, turbid water is unfit for human consumption and can lead to hygiene and health problems.

Artisanal mining is carried out using mercury or sodium cyanide, which are highly toxic products. Without adequate management measures, elemental mercury is released into the air, soil, surface and groundwater in liquid and gaseous form during ore processing and amalgam burning. This elemental mercury can transform into an organic form that concentrates as it moves up the food chain, causing neurological damage and other health problems in humans. Mercury is found in high concentrations in fish and molluscs. When it comes into contact with water, sodium cyanide is transformed into a highly flammable and toxic gas that kills organisms. Unlike mercury, sodium cyanide does not accumulate in the food chain.

SIDEBAR 7 A MORE SUSTAINABLE MINING SECTOR?

Major mining projects are preceded by an Environmental and Social Impact Assessment (ESIA). The purpose of such a study is to identify and quantify all potential environmental and social impacts, and to propose measures to reduce these impacts as far as possible. If it is not possible to limit the impact, the ESIA proposes compensation measures.

Once the mining project has been accepted, the ESIA leads to the development and implementation of an Environmental and Social Management Plan (ESMP), which sets out measures for mitigating risks, restoring sites, improving biodiversity where possible, and compensating for destroyed habitats, together with a timetable for implementation. Examples of measures include better planning of mine development and rehabilitation, reducing pollutant emissions into the atmosphere, decanting water used in artisanal mining before it is released into the environment, banning the use of mercury and cyanide, and so on. However, ESIAs are often of poor quality, and impact mitigation activities are not always implemented.

The governments of certain West African countries (Benin, Burkina Faso, Côte d'Ivoire, Ghana, Guinea, Mali, Niger and Senegal) met in Niger in 2021 to lay the foundations for the development of sustainable artisanal mining. At the end of the meeting, the Niamey Declaration was signed, endorsing the importance of (i) establishing a multi-stakeholder dialogue, (ii) tackling the problem of artisanal gold mining using an interdisciplinary approach, (iii) identifying and sharing innovative solutions at all levels of the sector, and (iv) rethinking the regulatory framework for artisanal mining using this multi-stakeholder and regional approach. Theoretical wishes that it is hoped will have concrete effects on the ground.

Indirectly, the development of mining activities often takes place in initially inaccessible areas, which then become centres of human concentration (several hundred people directly for the mine, their families, plus other people attracted by development opportunities and related activities). The pressure generated on forest resources is significant: collection of firewood, installation of agricultural plots, hunting and fishing activities, as well as the production of waste. The creation of a road network for the industrial mines also facilitates access to these initially isolated areas.

Finally, mining concessions often overlap with protected areas. For national governments, mining permits and the associated short-term economic impacts often take priority over biodiversity conservation issues. There have been several cases of parts of protected areas being downgraded corresponding to mining permits (see Sidebar 6: The impact of industrial mining operations on protected areas: the case of the Nimba landscape).

INFRASTRUCTURE DEVELOPMENT AND URBANISATION

The development of the forest countries of West Africa requires the establishment of new infrastructures, including urbanisation, the creation of transport networks and energy production. In the Guinean forests in particular, access roads such as major highways and railways are being created to open up these forested areas, and hydroelectric facilities are being built to supply energy. This development is strongly felt in the lowland forests of Niger because of their high population densities, as well as in the swamp forests of the Niger Delta and the mangroves of Guinea, where road and canal networks are being developed in connection with oil exploitation.

Road cut through the forest in the Wologizi-Wonegizi landscape, Liberia. (© M. Languy)

Roads and railways

The establishment of road and rail networks is a corollary of economic and human development. Good roads and railways are needed to provide access to sites where natural resources are extracted and their associated processing infrastructures, and to enable these sites to be supplied and the raw materials or processing products to be evacuated. It is often the cost of transport that determines whether a project will be profitable or not. These networks also improve rural communities' means of communication and their access to basic necessities and other consumer products. They greatly facilitate movement towards health and education facilities when these are not available locally and are often the first step in the development of landlocked areas.

However, like all development, transport infrastructure has a negative impact on the natural environment. The direct impact of road and rail infrastructure on forest cover (i.e. the loss of forest habitat) is relatively moderate in terms of encroachment, with a maximum width of several dozen metres. Their indirect impacts, on the other hand, represent a major threat:

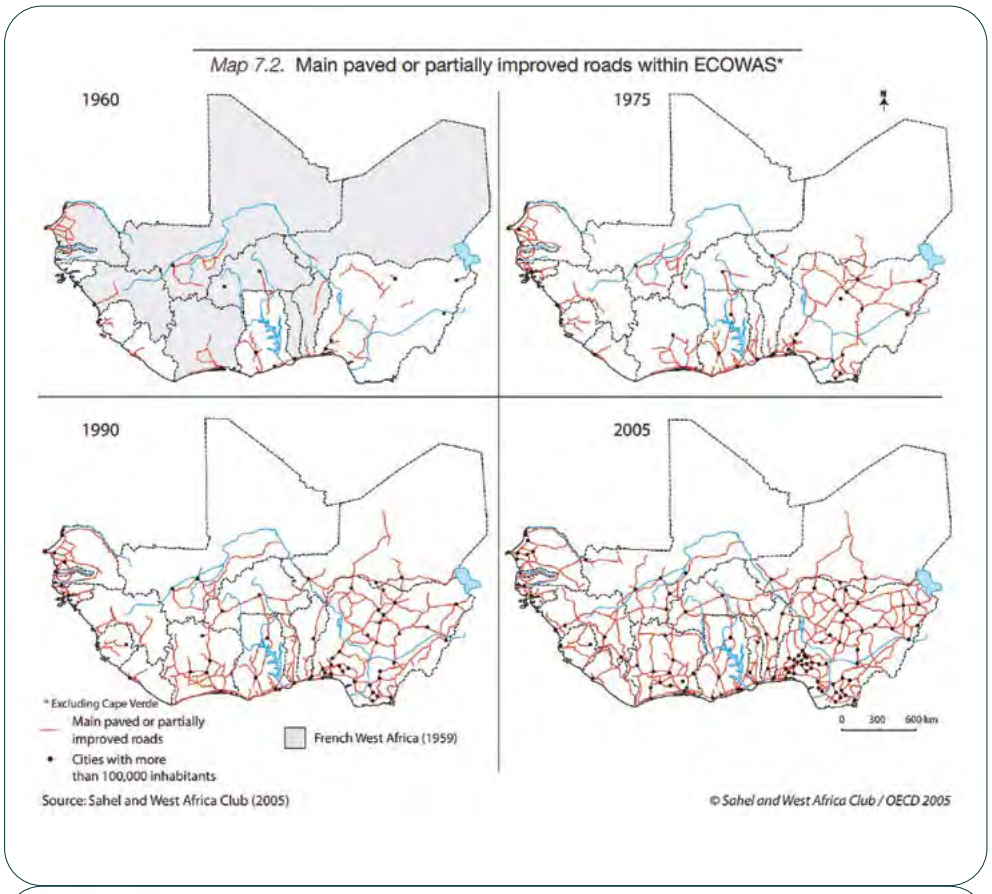
- Associated degradation and fragmentation of the habitats of numerous animal species;
- Opening up initially sparsely populated forest areas, making it easier to transport agricultural and forestry products (timber, but also bushmeat and other NTFPs, etc.) to urban centres;
- The migration of people towards forests where new economic activities are being developed, leading to the clearing of forest areas for food crops, an increase in hunting for local consumption, and increased exploitation of timber and firewood;
- The proliferation of invasive exotic plant species, such as *Chromolaena odorata*, the most common in West Africa, which forms dense bushes that prevent other plant species from growing. The problem of invasive alien species is considered to be the second biggest cause of biodiversity loss in the world, after the disappearance of natural habitats.

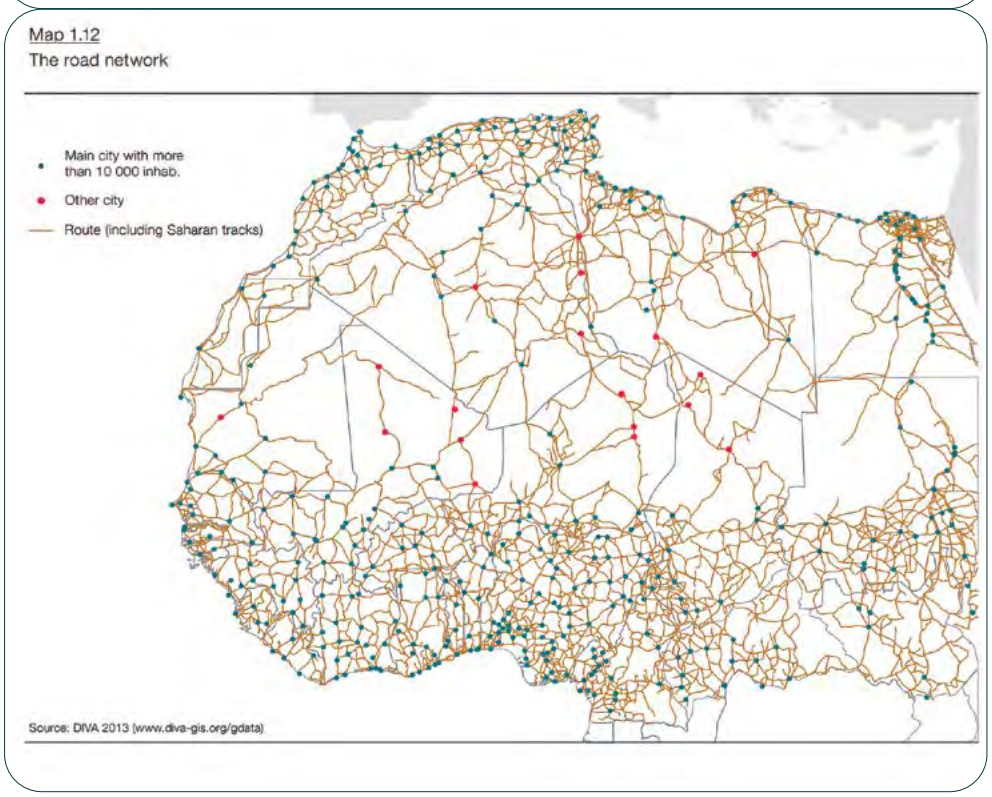
When these structures are poorly built or maintained, they can also lead to the degradation of certain ecosystems, mainly through lack of drainage (accumulation of water with a 'dam effect') or through erosion (increased run-off, loss of soil, and sedimentation).

In a little over half a century, the network of major roads has developed enormously, as shown in Figure 14. The forest areas of West Africa are particularly threatened, with all the associated direct and indirect impacts on the biodiversity of Guinean forests.

This extensive network of major roads contributes to the loss, degradation and fragmentation of these forests. This is where the effective establishment of key landscapes for conservation and development (KLCDs) comes into its own. These KLCDs are made up of protected areas that are linked and connected to each other by ecological corridors and form forest massifs that are not cut up by transport networks. In this way, they make it possible to preserve vast areas of relatively intact and representative forests, as well as emblematic animal species.

FIGURE 14 Evolution of the road network in West Africa from 1960 to 2014





Souce : OCDE, 2009 et 2014

Dakar, Senegal. The West African region is the largest urbanised area in Africa in terms of population. (Juan Vilata / Alamy Stock Photo)

SIDEBAR 8 COMPENSATING PRIVATE SECTOR PROJECTS WITH BIODIVERSITY OFFSETS

Biodiversity offsets are measurable conservation outcomes provided to the private sector to compensate for the significant negative impacts of development projects on biodiversity that could not be prevented and mitigated during project development. The objective of biodiversity offsets is to achieve no net loss and, preferably, a net gain of biodiversity on the ground in terms of species composition, habitat structure, ecosystem function, and community use and cultural values associated with biodiversity. Generally speaking, offsetting is achieved by protecting large areas of habitat for the conservation of species and the preservation of their habitats. It can be carried out on the outskirts of protected areas in order to increase their surface area or lead to the creation of new protected areas, corridors or the restoration of important areas for biodiversity. In some cases, compensation is achieved through the targeted management of a species or group of species in an existing area.

However, the concept of compensation is criticised by certain environmental or human rights organisations due to the commercialisation of biodiversity, the simplification of considerations without taking into account the complex characteristics of biodiversity components and their interaction, and the failure to take sufficient account of local communities.

Dams

Numerous hydroelectric installations are being built to make up the energy shortfall required for development. They offer solutions for constant, long-term, non-carbon (or low-carbon if construction and maintenance requirements are taken into account) energy production adapted to tropical rainforest areas, and can help reduce demand for firewood and charcoal. However, these installations, such as reservoir dams or hydroelectric dams, lead to the destruction of thousands of hectares of forest.

By flooding large areas of tropical forest, dams reduce habitats for local wildlife and send carbon into the atmosphere (as the submerged wood rots), increasing the greenhouse gases that cause climate change.

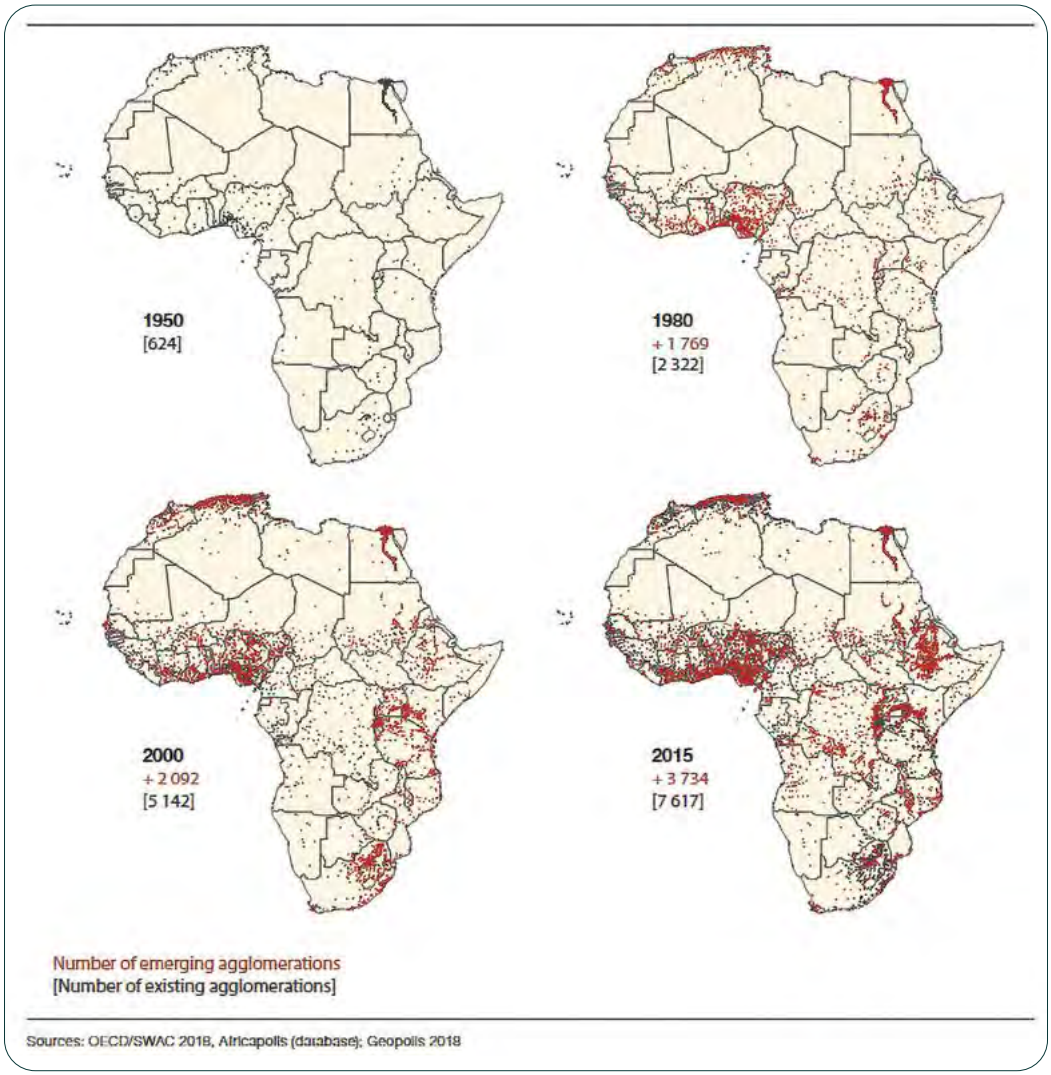
Hydroelectric power stations also have a well-known negative impact on fish populations. They destroy aquatic habitats and create barriers that isolate populations from each other and prevent the movement of migratory species. Their construction often results in a reduction in the number of individuals and a loss of diversity, and impacts local communities that depend on fishing for food or income.

Urban areas

In conjunction with population growth, urban expansion has a direct impact on forests with peri-urban deforestation to accommodate the expansion of the urban area. It also has an indirect impact with the increased need for wood for construction, firewood and food products (agricultural produce, bushmeat, and other NTFPs) to feed the urban population. As the saying goes, the city eats the forest. In terms of Africa as a whole, West Africa, particularly the area covered by the Guinean forests, has been the most urbanised region since 1950 (Figure 15).

The West Africa region is the most urbanised in Africa in terms of the number of inhabitants (around 133.6 million in urban areas) and the number of conurbations (1 760 as of 2015).

FIGURE 15 Evolution of the development of urban areas in Africa from 1950 to 2015



Source: Sahel and West Africa Club (OECD/SWAC), 2020.

A charcoal production site in Côte d'Ivoire. (© B. Haurez)

2.4.2 FOREST DEGRADATION DRIVERS

FUELWOOD COLLECTION AND CHARCOAL PRODUCTION

Wood was the first source of energy used by human populations, and remains today the main source of energy for millions of households in Central and West Africa. In 2009, 653 million people in sub-Saharan Africa relied on traditional biomass for cooking, and this figure is expected to rise to 918 million by 2023. In the forest regions of tropical countries, where electricity grids are still underdeveloped, it is a readily available, free resource that provides the energy needed for food preparation and, to a lesser extent, home heating. Wood is used either directly in the home by combustion, or after artisanal processing into charcoal. In the early 2000s, wood energy provided around 85 % of the energy consumed in West Africa, and accounted for 90 % of the wood harvested.

Converting the wood into charcoal increases its calorific value[11], reduces the speed of combustion and reduces its mass, making it easier to transport over long distances. This transformation is carried out by pyrolysis of the wood in the absence of oxygen. Different types of traditional stacking are used to carry out this pyrolysis: pit stacking, where the wood is placed in pits dug in the ground, or heap stacking. The stacked wood is covered with grass and earth, and sometimes with stumps. Some improved millstones involve a more elaborate and permanent construction, with walls and roofs, and devices to control

11 The calorific density of charcoal is around 28 to 33 MJ/kg, while that of dry wood is 18 MJ/kg (varying according to the species considered). However, when wood is converted into charcoal, around 80 % of the initial calorific value is lost. It takes 5 to 12 kg of wood to produce 1 kg of charcoal with a traditional millstone. The process of turning wood into charcoal therefore represents a net loss of energy. The process also takes a considerable amount of time: a few days to 2 weeks.

SIDEBAR 9 TOWARDS SUSTAINABLE CHARCOAL PRODUCTION?

Various projects to support the sustainable production of charcoal are based on the planting of fast-growing trees, and the construction of improved millstones (for transforming wood into charcoal) and ovens (for consuming the charcoal when preparing meals), which increase the yields of the various processes involved and therefore reduce energy losses. Advice on the pyrolysis process can be given to local populations: drying the wood before combustion, sizing the pieces of wood, monitoring the process, etc. In the Democratic Republic of Congo, in Central Africa, the model developed on the Mampu site is based on sequential agroforestry, where manioc and/or maize are grown for 3 years, during which time acacia plants (*Acacia auriculiformis* or *A. mangium*) develop. After 3 years, the crop is moved to another plot and the trees continue to grow for a further 7 years. After 10 years, they are harvested to produce charcoal. The plot is cleared and burnt, causing the acacia seeds to germinate and provide natural regeneration. The 10-year cycle then begins again.

The replacement of traditional ovens with solar ones is also an opportunity in tropical countries, even though some thought is required as to their upkeep and maintenance.

airflow. Charcoal produced in rural areas is widely used as a source of energy for urban centres. The informal and very short supply chain means that charcoal prices are relatively low compared with other energy sources, making it a product of choice for urban households. It also requires no special equipment to use.

Fuelwood collection and charcoal production are generally informal activities with little or no structure. Fuelwood is consumed directly by households in rural areas, while charcoal is generally sold locally or transported to the major cities in urban areas. It is therefore difficult to obtain figures for the volumes and financial aspects of these sectors. For Africa, fuelwood consumption was estimated at almost 700 million m^3 in 2010, with an annual per capita consumption of almost 0.7 m^3, the highest per capita consumption in the world. Charcoal production in West Africa reached 12 million tonnes in 2021. According to the FAO, Africa is the world's leading charcoal-producing continent, accounting for almost 60 % of global production. Consumption of fuelwood and charcoal is growing rapidly in Central and West Africa, with a considerable impact on forest degradation and loss, which are also on the increase.

Despite the lack of data on these sectors, their impact on the tropical forests of Central and West Africa is well established. The conversion of forests for agriculture and their exploitation for the production of fuelwood and charcoal are closely linked. They follow a typical sequence of stages: (i) exploitation of the noble species, (ii) exploitation of trees of lesser interest for local construction, (iii) exploitation of the residual cover by charcoal makers, and (iv) conversion to agricultural land.

Fuelwood collection and charcoal production are major drivers of degradation and deforestation in the ecoregions of the lowland forests of the western Gulf of Guinea, the forests of eastern Guinea and the Guinean mangroves.

→
*The kapok tree (*Ceiba pentandra*, Malvaceae) is exploitable and one of the last species of large tree still frequently found in Côte d'Ivoire. (© J.-L. Doucet)*

↓
*Samba (*Triplochiton scleroxylon*, Malvaceae) (© J.-L. Doucet) and frake (*Terminalia superba*, Combretaceae) (© J.-L. Doucet), two species from the Guinean forests exploited for their timber.*

INDUSTRIAL FORESTRY

Forestry involves felling, processing and transporting timber. In tropical forests, clearing was widely practised in the past. Since then, it has been replaced by 'selective felling', which targets the tree species of economic interest, i.e. to be commercialised. In theory, it is based on exhaustive inventories of the wood species of interest and their precise geolocation, as well as on a planned network of tracks and roads that enable the trees of interest to be exploited while reducing the impact on the forest massif, as well as the financial costs.

Many species of commercial interest are found in the forests of West Africa. The main commercial species in the region are listed in Table 19.

Teak (*Tectona grandis, Verbenaceae*), a fast-growing species native to Asia, is also exploited for its timber. Introduced to West Africa by the Germans at the end of the 19th century, it is produced in large single-species plantations, the impact and characteristics of which are similar to those of large-scale agro-industrial plantations. Côte d'Ivoire is Africa's leading producer, followed by Ghana and Nigeria.

Table 20 gives an indication of the volumes produced, imported, exported and consumed for the domestic market. Only Nigeria is ranked among the world's leading producers of forest products.

TABLE 19 The main commercially exploited tree species (historically or currently) in West Africa

Family	Common name	Scientific name	Uses
Euphorbiaceae	Rikio, river mangrove	*Uapaca guinnensis*	Today, usage is confined to traditional medicine.
Fabaceae	Dabema	*Piptadeniastrum africanum*	Interior joinery and framework. Very strong odour.
Fabaceae	Tali	*Erythrophleum ivorense, Erythrophleum suaveolens*	Heavy carpentry, crossbeams, bridges. Heavy, rot-resistant wood.
Malvaceae	Kapok tree	*Ceiba pentandra*	Interior carpentry. Used locally to manufacture dugout canoes. Very light wood.
Malvaceae	Niangon	*Heritiera utilis*	Interior carpentry, cabinetwork, woodwork.
Malvaceae	Samba, ayous	*Triplochiton scleroxylon*	Interior carpentry, plywood. Very light wood.
Meliaceae	Mahogany	*Khaya ivorensis*	Interior carpentry and cabinetwork. Used locally to manufacture dugout canoes.
Meliaceae	Dibetou	*Lovoa trichiliodes*	Cabinetwork, decorative veneers, interior woodwork.
Meliaceae	Sapele	*Entandrophragma cylindricum*	Parquetry, interior woodwork, cabinetwork, interior joinery.
Meliaceae	Sipo	*Entandrophragma utile*	Joinery, cabinetwork, veneers.
Meliaceae	Tiama	*Entandrophragma angolense*	Joinery, cabinetwork, veneers.
Moraceae	Upas	*Antiaris toxicaria*	Interior joinery. Locally used to manufacture dugout canoes.
Moraceae	Iroko	*Milicia excelsa*	Interior and exterior joinery, cabinetwork.
Ochnaceae	Azobe	*Lophira alata*	Railway sleepers, hydraulic works. Very heavy wood.
Rubiaceae	Bilinga	*Nauclea diderrichii*	Exterior woodwork, sleepers, bridges. Rot-resistant wood.
Combretacea	Frake, limba	*Terminalia superba*	Interior joinery.
Combretaceae	Framire	*Terminalia ivorensis*	Light construction, interior joinery.

TABLE 20 Industrial logging in the main countries covered by Guinean forests (volumes produced, imported, exported and consumed for the domestic market)

	Quantity produced (x 1 000 m³)	Quantity imported (x 1 000 m³)	Domestic consumption (x 1 000 m³)	Quantity exported (x 1 000 m³)
Nigeria (FAO 2021, 2017 data)				
Logs	10 002	1	9 418	584
Sawn timber	2 002	0	1 947	55
Veneer	2	2	1	1
Plywood	56	144	53	3
Ghana (ITTO 2019, 2017 data)				
Logs	2 450	10	2 104	446
Sawn timber	534	4	449	89
Veneer	262	0	245	16
Plywood	180	16	172	24
Côte d'Ivoire (ITTO 2019, 2017 data)				
Logs	2 415	1	2 388	28
Sawn timber	872	0	747	127
Veneer	245	2	148	97
Plywood	106	4	77	33
Liberia (ITTO 2019, 2017 data)				
Logs	501	0	365	136
Sawn timber	133	1	132	1
Veneer	0	0	0	0
Plywood	0	7	7	0
Sierra Leone (FAO 2021, 2017 data)				
Logs	124	0	78	46
Sawn timber	30	0	10	20
Veneer	1	0	1	0
Plywood	0	3	0	0

Sources : The Timber Trade Portal : https://www.timbertradeportal.com/fr/, OIBT/ITTO Database: https://www.itto.int/fr/biennal_review/, FAO Stat – Forestry Production and Trade: http://www.fao.org/faostat/fr/#data/FO

Aerial image showing selective felling in a concession, Ghana. (Capture Ghana / EU FLEGT Facility)

TABLE 21 Top 5 wood export markets for the main countries covered by Guinean forests

Côte d'Ivoire	Ghana	Liberia	Nigeria	Sierra Leone
China	China	China	Spain	China
France	USA	Thailand	China	Poland
Portugal	Turkey	South Africa	Israel	France
Turkey	South Africa	Brazil	Saudi Arabia	Austria
Austria	Chile	Spain	Ghana	Senegal

Source: Trade statistics for international business development https://www.trademap.org (ITC (2020) International Trade Centre – Wood and articles of wood; wood charcoal)

Table 21 shows the export markets for timber products. It highlights the predominance of China as an importer of timber from Guinean forests, a market with very few requirements in terms of timber origin.

According to Global Forest Watch (in 2022), industrial logging is responsible for only a very small proportion of the loss of forest cover (a few hundred hectares per year) in countries such as Côte d'Ivoire, Ghana, Guinea, Liberia and Nigeria. In Sierra Leone, industrial logging is the leading cause of deforestation and forest degradation, on a par with artisanal logging. However, the exploitation of forests for timber production, whether legal or illegal, is a factor in the degradation of tropical forests. This is most evident in the lowland forests of the western Gulf of Guinea, the forests of eastern Guinea, the lowland forests of Niger and the Cross coastal forests. Industrial logging directly impacts the Guinean forests, largely due to:

- damage caused by felling and other openings caused by roads and various infrastructures, resulting in a loss of forest area and a reduction in biomass (forest degradation);
- habitat fragmentation caused by the opening of forest access roads, which can act as a barrier to certain animal species, particularly strictly arboreal species;
- noise and other disturbances linked to logging activities, from inventory taking all the way to the transport of products, which can for example cause certain primates to flee or even put them into conflict

Stump of a felled rosewood tree in Outamba National Park, Sierra Leone. Selective logging has direct and indirect impacts. (© M. Languy)

with groups in adjacent territories in the case of important displacements. This is the case for chimpanzees, which are a territorial species;
- changes in the floristic composition of the forest stand as a result of the selective removal of harvested species and the opening up of the forest canopy, leading to the development of new species linked to the arrival of light on the ground;
- soil erosion, accumulation of sediments and pollution (hydrocarbons and chemical products);
- reduction in the number of seeds available, and the loss of genetic diversity through the felling of the mature and often best-conformed trees, which disseminate seeds for these species.

In addition, certain components of the vegetation play an essential role for wildlife (fruit, key resources in the dry season, leaves) and certain animal communities are particularly dependent on the forest ecosystem (frugivores, folivores, insectivores). Changes in the structure and composition of forest stands can lead to changes in the availability of food resources, to the scarcity or disappearance of a key resource, or to changes in interactions between species or between individuals (predation, territoriality).

To these direct impacts are added indirect impacts that stem from selective logging. The main indirect effects of selective logging on the forest ecosystem are:
- an increase in the forest's human population (workers, their families and other populations linked to local economic development), which increases the pressure of agricultural deforestation on the woodlands around the home base. As a result, although selective logging causes little direct deforestation, it can lead to the development of activities that contribute to the loss of forest cover. This concentration of people also generates a high demand for food. The living bases and staff in the forest represent a local market for agricultural produce and bushmeat. The market for game develops through the local populations, who traditionally hunted for their own consumption. Their practices evolve towards a lucrative activity, carried

A logging truck in Côte d'Ivoire.
(Michael Dwyer / Alamy Stock Photo)

out intensively using modern and often illegal weapons. Forestry company employees and their beneficiaries also sometimes hunt for their own consumption;

- in addition to the previous point, there is a growing health risk due to the increase in contact between humans and wildlife on the one hand, and between domestic animals and wildlife on the other, factors that encourage the spread of zoonoses (contagious diseases that can be transmitted from animals to humans in natural circumstances);
- increased access to isolated forests and means of transport, which facilitates hunting in unexploited forests, trade in bushmeat to urban centres, and large-scale poaching for the national and international markets (illegal and mafia-style networks are structured around the corruption of officials).

Unlike in Central Africa, forest management in Guinean forests is not widespread, and almost non-existent. A sustainably managed forest concession covers an area of several thousand to several hundred thousand hectares.

Logging by the company awarded the concession is progressive – a limited area is logged each year, known as the annual allowable cut (AAC) – and selective (a few trees felled per hectare). The concession is exploited over a period of between 20 and 30 years (known as a 'rotation'), with trees being felled successively in the different AACs. After each rotation, a new management plan is drawn up, and logging resumes first in the areas logged at the start of the rotation. In principle, this ensures the time needed for regeneration (production of new tree seedlings from seed) and reconstitution (growth of unfelled trees to a size suitable for logging) of the forest resources that have been harvested. Initiatives are needed to carry out forest inventories to quantify the densities and volumes present, and to develop/implement comprehensive management plans in accordance with the applicable laws. Without reliable forest management plans, it is impossible to ensure the environmental, social and economic sustainability of forest management.

SIDEBAR 10 DIFFERENT OPPORTUNITIES TO REDUCE THE NEGATIVE IMPACTS OF INDUSTRIAL LOGGING

Banning the trade in tropical timber on the international market is not the solution to limiting or even eliminating the negative impacts of logging. If trade in tropical timber were banned or boycotted, tropical forests would lose their economic and political value, and there would be strong pressure to clear them and use them for agro-pastoral or agro-industrial purposes (rubber, coconut, oil palm). The main problems associated with industrial timber exploitation can be mitigated by (i) sustainable management of forest concessions, (ii) reduced-impact logging, and (iii) the development of forest certification systems by forestry companies operating in Guinean forests.

Reduced-impact logging

Reduced-impact logging consists of planned and controlled logging operations in order to reduce their impact on the forests as much as possible. Various practices are recommended:

- Forest inventories prior to logging. These are used to quantify the volumes of timber that can be exploited and to geolocate resources;
- Mapping of the individual trees to be harvested;
- Based on this mapping and the biophysical characteristics of the concession, roads, skid trails and unloading areas are planned before timber harvesting begins;
- The construction of roads, runways and areas using methods that respect the environment and minimise encroachment while ensuring safety;
- The use of adapted techniques for felling and cutting that avoid wastage (directional and controlled felling);
- Carrying out post-harvest assessments to provide feedback to resource managers and operating teams according to a precise monitoring and evaluation schedule.

Sustainable management certifications

The concept of certified wood provides consumers with guarantees about forest management and the traceability of different wood-based products, thanks to an independent control system. This system enables a label to be affixed to the finished product, provided that the forestry company complies with all the environmental, social and economic criteria defined by the certification standard. There are currently two certification standards for sustainable forestry: the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC), which is adapted to the Pan African Forest Certification (PAFC) for the Congo Basin.

Zero deforestation sourcing ensures that no forest conversion for agriculture or industrial plantations takes place in forests with high carbon stocks (HCS), high biodiversity or cultural value (high conservation value or HCV), or forests subject to social conflict. The objective of committing to zero deforestation makes it possible to mitigate these three types of risk.

The legality of wood

To answer the challenges linked to illegal logging, the European Commission launched the Forest Law Enforcement, Governance and Trade (FLEGT) programme in 2003, the goal of which is to strengthen sustainable and legal forest management, improve forest governance, and promote the trade of legally produced wood. It is based on voluntary bilateral agreements between the EU and an exporting country, which define the legality criteria for that specific country. Once the Voluntary Partnership Agreement (VPA) has been validated, only timber recognised as legal from that country can enter the EU. However, the establishment and implementation of VPAs and FLEGT is very time-consuming and complex. Cameroon, Ghana and Liberia currently have signed VPAs with the EU, and Côte d'Ivoire is in negotiations. No timber from West Africa has yet been recognised as covered by FLEGT.

SIDEBAR 11 TAKING WILDLIFE INTO ACCOUNT IN FOREST CONCESSIONS

With regard to the impact of industrial logging on wildlife, the growing demands of certification systems and conservation organisations in Central Africa have led to the emergence of wildlife management initiatives within forest concessions. Although the sector in West Africa is less advanced in this area, the experiences gained in Central Africa and the resulting capitalisation can provide a very useful basis for initiating the integration of wildlife management into forest concessions in the Guinean forests.

Among the tools available, the FauneFac toolbox and the book *Élaboration et mise en œuvre d'un plan de gestion de la faune. Guide technique à destination des gestionnaires des forêts de production d'Afrique centrale (Drawing up and implementing a wildlife management plan. Technical guide for managers of production forests in Central Africa)* are the products of some 15 years of collaboration and support for the forestry sector by the non-profit association Nature+ and the Forest is life team at GxABT.

FauneFac is a methodological toolbox for setting up photo-trap inventories. It provides free access to various tools for planning an inventory, facilitating species identification, data encoding and analysis via the EurêCam! application.

The book aims to support forest managers in the management of animal communities within their concessions. Developed in the context of Central Africa, it covers the aspects to be considered according to national legislative frameworks. It is also a pragmatic tool that presents the process of drawing up a wildlife management plan, and the various measures that can be implemented to ensure the management and conservation of animal populations. In the form of technical fact sheets, it covers wildlife inventories, environmental awareness strategies, the fight against illegal activities and poaching, and the management of human-wildlife conflicts. The principles and approaches developed go well beyond forest concessions in the Congo Basin, and can be transposed to other geographical areas, as well as to other forms of land use, such as protected areas and community forests.

First edition of the book Élaboration et mise en œuvre d'un plan de gestion de la faune. Guide technique à destination des gestionnaires des forêts de production d'Afrique centrale.

References:

- *Fonteyn, D., Doucet, J.-L., Fayolle, A., Monseur, A., Quevauvillers, S., Holvoet, J., Poulain, F., Delame, H., Peeters, Q. and Vermeulen, C., (2021).* FauneFAC: Boite à outils méthodologique pour la mise en place d'inventaires par pièges photographiques. *ULiège/Gembloux Agro-Bio Tech, PPECF.* https://www.gembloux.ulg.ac.be/faunefac/
- *Application EurêCam !:* http://shiny.gxabt.ulg.ac.be/FauneFac/?fbclid=IwAR10dGHtuH-vvD81Ql8zNagF0VCIA3e7YpkdbRZabdtrWQO3x85N5RiEeOE
- *Haurez, B., Fonteyn, D., Toint, S., Bracke, C., Doucet, J.-L., Daïnou, K., Kéhou, S. and Vermeulen C. (2020).* Élaboration et mise en œuvre d'un plan de gestion de la faune. Guide technique à destination des gestionnaires des forêts de production d'Afrique centrale. *Gembloux, Belgium: Presses agronomiques de Gembloux. Accessible at the following link:* https://orbi.uliege.be/handle/2268/253115

Artisanal sawmilling in the periphery of the Wologizi forest, Liberia. (© PAPFor)

A spot-nosed monkey poached in the Grebo-Krahn National Park, Liberia, on the way to being sold in town. (© M. Languy)

ARTISANAL FORESTRY

Artisanal logging can be defined as a set of activities carried out by small independent loggers, with or without a licence, with the main aim of selling sawn timber on the domestic market or in certain neighbouring countries.

This sector is virtually undocumented in Guinea's forests, whereas it receives a great deal of attention in some Central African countries, notably the DRC. There, artisanal logging is often seen as a way of circumventing legal logging permits, where it remains essentially in the informal sector due to legal loopholes. An increase in artisanal sawmilling has been observed in recent years due to the growth in the size of the urban population and a relative increase in the purchasing power of certain urban classes.

Local populations are major beneficiaries of artisanal sawmilling, notably through the sale of trees, salaries, expenses, profits in rural areas and payments for specifications. Today, small-scale artisanal sawmilling creates many jobs. The administration is said to capture a percentage of the net revenue generated by the sector, but probably a large proportion of taxes is not paid to the treasury and is directly captured by representatives of the administrations.

Despite the few studies available on the subject, artisanal sawmilling is cited as the leading cause of deforestation and forest degradation in Sierra Leone (on a par with industrial logging), and the second leading cause in Liberia (after subsistence farming).

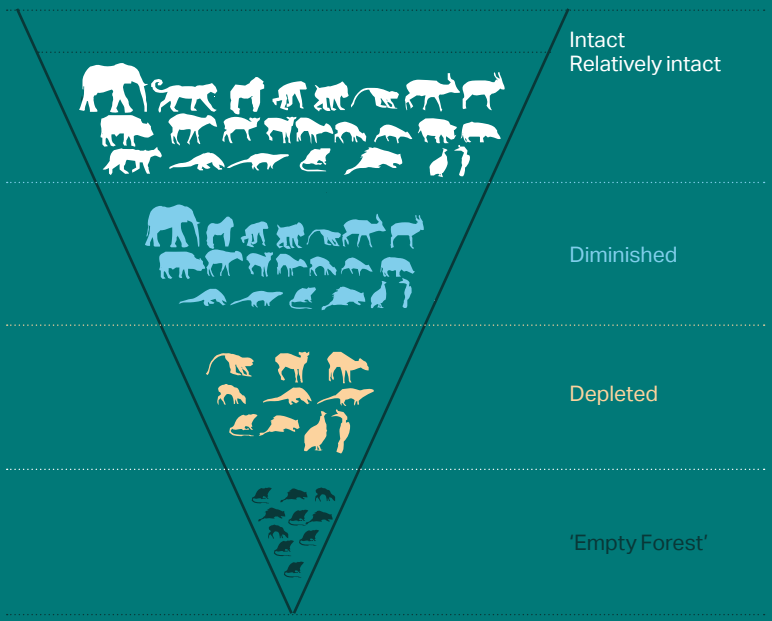
HUNTING AND BUSHMEAT TRADE

Although the disappearance of forests linked to their conversion to other land uses is a major problem, other more insidious threats also impact forest ecosystems. These include hunting activities and the development of the trade in game meat, commonly known as bushmeat. The increase and expansion of hunting in previously inaccessible forest areas has led to the creation of forests whose cover is relatively well preserved, but whose animal communities have been greatly reduced. These forests, from which certain animal species have been totally extirpated, are, as it were, 'empty forests', which is sometimes referred to as the 'silent forest syndrome'.

Monitoring the impact of hunting activities is much more complex than that of deforestation, since it cannot be done remotely, using images produced by satellites and remote sensing methods. However, hunting and the trade in meat and other animal products are recognised as the main threat to populations of great apes and other primates, elephants, antelopes and duikers. These are factors in forest degradation that are very present in the vast majority of Guinean forests with animal communities heavily impacted by hunting.

There are two main causes of this scourge, also known as 'defaunation': excessive harvesting for local meat consumption, which is associated with population growth and the creation of forestry towns at the base camps of the mining and logging industries; and illegal trade to fuel national or international trafficking in live species, meat, or animal parts (ivory, skin, scales, etc.). This organised poaching network is facilitated by the development of road and rail networks, whether or not associated with the installation of extraction industries.

FIGURE 16 Schematic representation of the defaunation phenomenon. In the process, species of large and medium-sized mammals, which are the most sensitive and the most hunted, see their abundance diminish and then disappear in favour of more prolific and smaller species. Source: Bruce et al., 2017.



SIDEBAR 12 DEFAUNATION

The concept of defaunation refers to a progressive impoverishment of animal communities, which includes a reduction in the abundance of animal species and, in the most advanced cases, the total extirpation of certain species from a defined area (local extinction) and therefore a reduction in species richness. These ecosystems initially have intact vegetation, but this is likely to change in the long term as a result of the disruption to its ecological processes. The dispersal of seeds by animal species (zoochory), either through the consumption of fruit and the passage of seeds through the digestive tract, or through the attachment of seeds to their fur using adapted devices, will gradually diminish. Similarly, seed predation by granivorous animals, predation of young seedlings by herbivores, and interactions within the animal community (predation and competition for food resources) will be altered, gradually leading to a profound change in forest composition. Certain animal species, known as keystone species, also play an essential role in the functioning of ecosystems. When these species, also known as 'forest engineers', disappear, the resulting impact on forest ecosystems is particularly significant. The forest elephant, for example, is involved in many of the actions that really shape forests: maintaining areas of open clearings, dispersing numerous plant species, eating young seedlings and the bark of mature trees, etc.

The defaunation process is gradual. Associated with the increase in hunting pressure, it affects firstly species of large and medium-sized mammals, either because they are the preferred target species of hunters due to their greater return on investment (a greater quantity of meat for a similar hunting effort), or because they are species most affected by poaching (elephant and rhinoceros for ivory, leopard for skin and teeth, gorillas and chimpanzees for their uses in rituals, pangolins for their scales, etc.). Large species are also more sensitive to hunting pressure because they present biological characteristics associated with a slow population dynamic (weak densities, late sexual maturity, limited reproductive rates, etc.). Once the densities of these wildlife species become too weak or almost none, hunters turn to species with medium biomass and less sensitivity to hunting pressure, typically duikers. Eventually, once the hunting pressure becomes too much, even middle-sized mammals can no longer maintain their population. The forest is then emptied of the majority of its animal community. The only species left are the prolific, small-sized ones, such as rodents, onto which hunters fall back.

This evolution of animal communities makes it possible to estimate the faunal status of forest areas by observing the hunting records or the species sold for their meat. The species composition and abundance of prey on the markets roughly reflect those of the forest.

A hunter on a motorbike leaving a village, Guinea.
(Mike Goldwater / Alamy Stock Photo)

Subsistence hunting

Often permitted by law under national forestry codes, subsistence hunting refers to hunting by villagers for meat consumption within the household and sometimes for small-scale local sales. This activity can become unsustainable when human population densities are high and the harvest becomes too great to guarantee the sustainability of the species hunted. Hunting is classified as poaching when it is illegal because the species hunted are protected by law; the activity is carried out in an area where hunting is prohibited (protected area); or because the capture technique used is illegal. However, it must be distinguished from major poaching, which refers to hunting that feeds structured networks of national and international trade in animal products.

Some hunting practices, particularly trap hunting, are non-discriminatory: they affect all species, including protected animals. As the traps are set periodically by the hunters, the animals often remain tied up for several days before being taken (very rarely released), which also leads to significant wastage.

Although the context is slightly different, studies of bushmeat consumption in Central Africa show that between 4 and 5 million tonnes of meat are consumed each year in the sub-region. It also represents a major economic sector, with, for example, almost EUR 100 million a year in Cameroon alone. All the studies indicate that consumption is too high to be sustainable. In one area of southern Cameroon, for example, village consumption is more than 30 kilos per km² per year, and all the hunters confirm a steady decline in the species hunted.

In addition to the degradation of forest ecosystems associated with hunting, there are major socioeconomic

SIDEBAR 13 PROTECTING ANIMAL SPECIES: BANNING HUNTING OR REASONABLE HUNTING?

Several types of measures can be taken to combat unsustainable subsistence hunting. In the case of protected species, raising awareness and providing information to local people while also combating poaching at a local level can help limit the numbers hunted. For unsustainable hunting, support projects can be used to help village communities find alternatives to hunting as a source of protein and as a means of subsistence (development of income-generating activities). These include the development of agricultural activities, the production and marketing of honey, ecotourism, fishing activities and the promotion of small-scale livestock farming. To ensure the success of such projects, it is essential to use participatory approaches to identify the activities to be developed and actively involve local communities.

Other approaches involve establishing hunting quotas based on the ecology of the species, and setting up a structured and legal bushmeat industry. The Sustainable Wild Meat (SWM)[a] programme is developing such approaches in Central Africa and the Sahelian wetlands of West Africa. However, these approaches are extremely complex and their full results are not yet available.

a) More information on the programme's website: https://www.swm-programme.info/fr/homepage

issues at stake. The decline in the abundance of animal species used for subsistence hunting threatens the food and nutritional security of all human populations who depend on bushmeat for their diet; the risk of transmitting zoonoses through the consumption or handling of animal products is also significant. The recent worldwide epidemics (Ebola and COVID-19) clearly illustrate the health importance of this threat to human populations, as well as its global scale.

Poaching and illegal commerce

Some species, such as elephant and pangolin, have been exploited for international trade to such an extent that they have disappeared from many regions. Pangolins, described as the most trafficked animals in the world, have been the subject of increasing illegal trade in West Africa. The collapse of Asian pangolin populations, together with the high value of pangolin products, has led criminals to source pangolins from Africa. Although the true impact of the illegal exploitation of this species in West Africa is largely unknown, the scale of trafficking (for example, more than 20 000 kg of African pangolin scales were seized between 2012 and 2016) is a major cause for concern.

An analysis revealed that of the world's 50 largest ivory seizures for which the origin was specified, 21 % exited via West or Central Africa. West Africa is not only a source of illegal ivory, it has also become a transit centre, with ivory being imported and exported from other parts of Africa.

Wildlife crime has a direct and negative impact on the economy and security of millions of people, and undermines good governance and the rule of law.

SIDEBAR 14 THE FIGHT AGAINST WILDLIFE TRAFFICKING IN CENTRAL AND WEST AFRICA: THE EAGLE MODEL

Major poaching is ordered and organised from urban centres by networks of wildlife traffickers. These mafia-style organisations organise the hunting, buying, selling and exporting of various animal products that are sought after for their financial value: ivory, pangolin scales, leopard skins, baby great apes, parrots, etc. Unfortunately, few projects or organisations are actually tackling these criminal networks and are instead targeting the poachers who are just their feet on the ground. Arresting countless poachers will not put an end to wildlife trafficking as long as the flow of money and desired wildlife products are maintained. Rather than talking about poaching problems, it would be wiser to talk about wildlife trafficking problems, but still, too few organisations have grasped this difference.

Furthermore, informed political decisions must be accompanied by concrete action on the ground to strengthen law enforcement and to combat corruption and influence peddling.

With this in mind, the EAGLE (Eco Activists for Governance and Law Enforcement) network was developed to strengthen wildlife law enforcement in a concrete, operational and effective way, while combating the corruption that is one of its causes. It targets wildlife trafficking networks rather than poachers, using police and judicial methods and a total commitment, based on militant values and principles to bring about positive change in wildlife protection.

←

Seizure of 3.8 tonnes of ivory in Lomé, Togo. The ivory originated in Gabon and Congo and was destined for Malaysia and Vietnam. (© EAGLE)

EAGLE originated in Central Africa through the model developed by the NGO LAGA in 2003. This model was then replicated in Congo in 2008 through the Aspinall Foundation, in Gabon in 2010 with Conservation Justice and then developed in West Africa: in Guinea in 2012, Togo in 2013, Benin in 2014, Senegal in 2014, Côte d'Ivoire in 2017 and Burkina Faso in 2018.

The EAGLE methodology is developed through four departments:

1. Investigations:
Identification, through a network of informers and undercover agents, of major wildlife traffickers and the production of concrete evidence against them.
2. Operations:
Support for law enforcement and forestry officers in organising operations to arrest wildlife traffickers in the act.
3. Legal:
Support for legal authorities to strengthen legal proceedings and monitor the enforcement of rulings.
4. Communication:
Publicising the results obtained in order to draw the public's attention to the effective application of the law and the risks involved, with a view to inform and dissuade.

The investigations carried out therefore target the main wildlife traffickers. EAGLE then facilitates their arrest by providing operational support to the forces of law and order, and then reinforces the legal proceedings thanks to teams of specialised lawyers and jurists. To act as a strong deterrent, arrests and convictions are widely publicised in the national and international media.

As the DNA analyses carried out on seized ivory attest, West Africa is now a major transit zone for wildlife products from Central Africa. Dealing with and analysing wildlife trafficking in and between these two sub-regions must therefore clearly go hand in hand.

EAGLE is run by activists with few financial resources but who are absolutely committed and determined. Around 10 people are active in each EAGLE member project. In total, they have led to the seizure of tens of tonnes of ivory and pangolin scales, hundreds of leopard and lion skins, thousands of parrots, and dozens of great apes. This has been made possible due to the confidence shown by the national authorities and a strengthened political will at all levels, based on grassroots action.

With more than 2 500 wildlife traffickers arrested, including more than 500 in West Africa, several major international wildlife trafficking networks have been dismantled thanks to EAGLE.

Luc Mathot, Director, Conservation Justice, and EAGLE network partner

2.4.3
CLIMATE CHANGE

Human activities emit large quantities of greenhouse gases. It is clear that carbon dioxide (CO_2) emissions are the main driver of climate change, although other greenhouse gases and atmospheric pollutants also have an impact on the climate.

According to the latest report from the Intergovernmental Panel on Climate Change (IPCC), scientists are observing changes in the climate in every region of the world. Many of the climate changes observed are unprecedented in thousands of years, and some of the changes already underway – such as the continuing rise in sea level – are irreversible over hundreds or thousands of years. However, strong and lasting reductions in greenhouse gas emissions (CO_2 in particular) would make it possible to limit climate change and achieve stable global temperatures in 20 to 30 years.

The effects of climate change observed in West Africa in recent decades include an increase in average temperatures, a decrease in average rainfall, and a delay and reduction in the length of the dry seasons (Table 22 and Figure 17). There has also been greater variability in climatic conditions. Regional climate projections predict an increase in temperatures in the region, but uncertainties remain regarding potential changes in precipitation in terms of direction (increase or decrease) and magnitude (absolute value of the change). According to the models, rainfall is likely to decrease in the (initially wetter) coastal areas of West Africa, and decrease or increase in the currently drier areas further inland. Rainfall variability is also set to increase. Extreme weather events, and their associated impacts, will increase in frequency. In particular, inter-annual temperature variability will increase, as will the occurrence of climatic episodes characterised by particularly hot temperatures.

In addition to rising temperatures, sea levels are expected to rise. In the event of a 1 m rise, 2 300 km² (0.4 %) of Guinean forests would be lost. In addition to this net loss, other negative consequences include increased coastal erosion, damage to existing infrastructure (and the potential need to replace it), and the salinisation of certain freshwater sources, habitats and agricultural areas.
It is likely that changes in climatic conditions in the region will lead to an increase in vegetation productivity in Guinean forests, and consequently an increase in carbon storage. These results indicate that Guinean forests could become an even more valuable resource for carbon storage in the future, helping to reduce the impacts of global climate change. However, the increase in future land

A bush fire in Gambia. The risk of such fires is increasing with global climate change. (Shutterstock / Agarianna76)

SIDEBAR 15 THE IPCC ON CLIMATE EVOLUTION

The IPCC is an intergovernmental body that was set up in 1988. It is open to all member countries of the United Nations (UN), currently comprising 195 states, and is part of the World Meteorological Organization and the United Nations Environment Programme. Its objectives are to provide detailed assessments of the state of scientific, technical and socioeconomic knowledge on climate change, its causes, its potential repercussions and the strategies to counter it. The IPCC regularly (every 5 to 8 years) produces a report on the state of scientific knowledge.

The latest report, published 20 March 2023, gives new estimations on the likelihood of breaching the 1.5 °C threshold in global warming over the next few decades and observes that unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting global warming to a level close to 1.5 °C or even 2 °C will be out of reach.

Climate change is leading to numerous changes in weather conditions in different regions. These include:

- more intense precipitations and associated floods at high altitudes;
- more intense droughts in numerous sub-tropical regions;
- continued rising of sea levels in coastal areas;
- decrease in seasonal snow cover, melting of glaciers and ice caps, disappearance of Arctic sea ice in summer;
- heating, acidification and reduction in the oxygen levels of oceans;
- etc.

The report predicts that, in the next decades, the effects of climate change will increase in every region of the world.

The report also shows that human actions can still determine future climate change. To stabilise the climate, greenhouse gas emissions would have to be reduced sharply, rapidly and sustainably, to achieve zero net CO_2 emissions (calculated by adding all the emissions and subtracting all the removals).

For more information:
IPCC : https://www.ipcc.ch/about/
Synthesis report of the IPCC Sixth Assessment Report, 20 March 2023:
https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_LongerReport.pdf
The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is the intergovernmental body that assesses the state of biodiversity and the ecosystem services it provides to society, in response to requests from decision-makers. https://ipbes.net/
New interactive atlas from the IPCC that offers information for all regions of the world, including West Africa:
https://interactive-atlas.ipcc.ch/

TABLE 22 Historical averages and trends of temperatures and rainfall in West African countries

Country	Temperatures (°C)		Rainfall (mm/month)	
	Average 1970-1999	Trend 1960-2006 (change per decade)	Average 1970-1999	Trend 1960-2006 (change per decade)
Côte d'Ivoire	ND	ND	ND	ND
Ghana	26.6	+ 0.21	98.0	- 2.3
Guinea	25.6	+ 0.18	134.7	- 4.5
Liberia	25.0	+ 0.18	186.4	- 5.4
Nigeria	26.2	+ 0.18	95.8	- 1.1
Sierra Leone	25.7	+ 0.18	197.8	- 6.9

Source: IUCN (2015).). Ecosystem profile Guinean Forests of West Africa Biodiversity Hotspot
https://www.cepf.net/sites/default/files/en_guinean_forests_ecosystem_profile.pdf

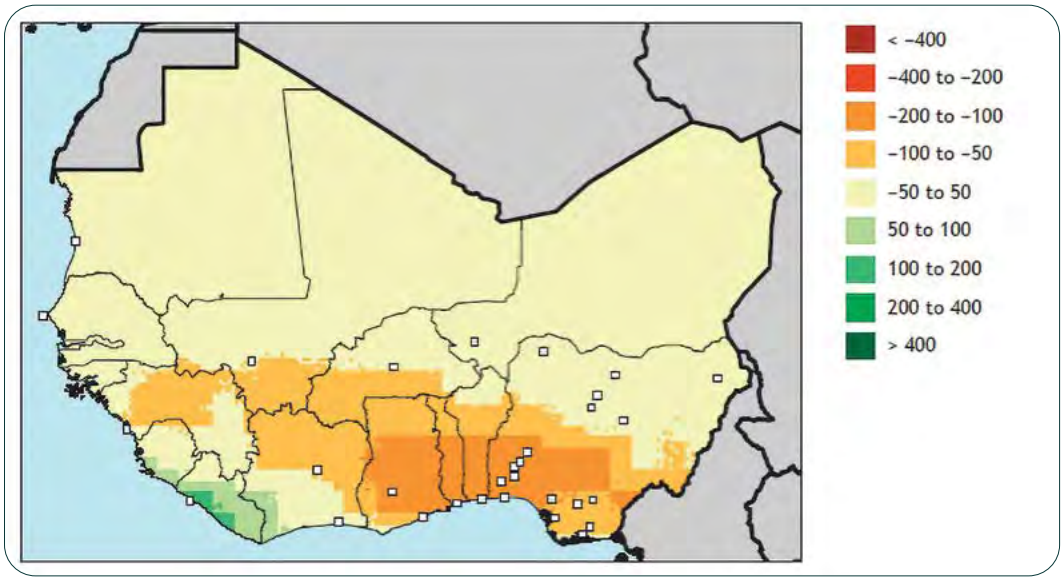
use for human activities (shifting and industrial agriculture, logging and mining, etc.) would considerably reduce this potential through an even greater conversion and exploitation of forests.

Many West African animal species have been identified as being vulnerable to climate change, based on their specific biological and ecological characteristics and their distribution ranges. A large proportion of amphibians, birds, freshwater fish, mammals and reptiles will see their ranges shift towards a less suitable climate before the end of the 21st century. As a result, changes in these distribution areas are expected, as species move to areas with more suitable climatic conditions. Extinctions of species unable to move or evolve quickly enough to adapt to their new conditions are to be expected. It is also possible that new species will colonise areas where they were initially absent, but these gains in species are unlikely to compensate for the losses observed on a local and regional scale.

Species that are both globally threatened and vulnerable to climate change should be considered as high priority for conservation action. For these species, specific management options may include the identification of areas with a suitable persistent climate within their current distribution or the development (extension and connectivity) of the existing network of protected areas.

Another possible impact of climate change is the modification of rainfall in the Sahelian or sub-Sahelian zone, north of the Guinean forests. It has been shown that climate change leads to reductions in agricultural productivity, which are more marked in Africa than in other continents, while the improvement in yields due to technical innovations is also less marked. The food deficits observed in West Africa are therefore likely to worsen. This could lead to more frequent or longer periods of famine, which would cause large-scale human migration towards forested areas further south, intensifying demographic pressures and the risk of deforestation.

FIGURE 17 Change (in mm) in average annual rainfall in West Africa from 2000 to 2050 according to the A1B model of the Commonwealth Scientific and Industrial Research Organization (CSIRO). The AB1 model is based on a greenhouse gas emission scenario associated with rapid economic growth, a demographic peak in the middle of the century, the development of new technologies to reduce energy consumption, and the use of various energy sources.



Source: Jalloh et al., 2013. © International Food Policy Research Institute (IFPRI)

Generally speaking, the impacts of climate change will reinforce the other threats already weighing on natural ecosystems, particularly forest ecosystems. Africa will be strongly affected because of its still rapidly growing human population, and climate change effects that could be more rapid and more pronounced there. Research is needed to produce up-to-date information on climate change in West Africa and its impact on both natural and man-made ecosystems (particularly agro-ecosystems).

Mangroves are a special ecosystem for combating and mitigating climate change.[12] Like other forest plant formations, they can store CO_2 in the form of plant biomass, but they can also protect coastal areas against rising sea levels and natural phenomena such as storms by acting as a buffer, as well as reducing erosion. The conservation of existing mangroves and the restoration of degraded or disappeared mangroves could therefore help to protect the coastal zones of West Africa from the risks associated with climate change.

12 According to the IPCC, climate change mitigation is defined as all practices designed to reduce greenhouse gas emissions or increase their fixation, and thus limit the rise in temperature and all associated effects. Climate change adaptation, on the other hand, refers to all the practices used to adapt human, natural or agricultural systems to observed or expected climate change.

Mangrove landscape in Marshall, Liberia. (© M. Languy)

2.5 MAIN FOREST BLOCKS WITH THE GREATEST POTENTIAL FOR RESILIENCE TO CURRENT PRESSURES AND CLIMATE CHANGE

As described in Section 2.4, there are many pressures on Guinean forests. The changes in land use and occupation that these pressures cause, and have caused over time, mainly result in a reduction in forest cover (deforestation or degradation). The deforestation rate figures extracted from analyses of satellite images are impressive and illustrate that this phenomenon is relatively recent (Table 11). In contrast to analyses of deforestation and degradation and their causes, it is relevant to consider the reasons and mechanisms that have allowed large forest blocks to largely retain their tree cover. These questions do not presuppose that the remaining forests, and above all their ecological functioning, will be preserved. Indeed, since analyses of changes in forest cover are nowadays based almost exclusively on satellite images, they provide no information on the potential problems of defaunation as presented in Section 2.4.2 and very little information on the slow impact of climate change (Section 2.4.3), which apart from its impact on mangroves, is likely to be anecdotal in the short term compared with other pressures that are rapidly and profoundly modifying forest areas.

2.5.1 RESILIENCE TO CLIMATE CHANGE

This issue needs to be addressed at several levels. An analysis of global or regional levels, which raises essential questions about the functioning of ecosystems in the face of general variations, has already been proposed in Section 2.4.3. The analysis of the main remaining forest blocks focuses more on the local level of the phenomenon.

On a global, continental or regional scale, climate change is often approached through two of its main basic variables: temperature and precipitation. These two variables form the basis of the Köppen-Geiger climate classification system. Changes are analysed by comparing recent values with past values. Time series analysis of these variables, which are often seasonal, can reveal (i) anomalies in

The island of Urok in the Bijagos archipelago, Guinea-Bissau. Traditional knowledge and culture are essential to preserving the islands' biodiversity (© Antoine Marchal)

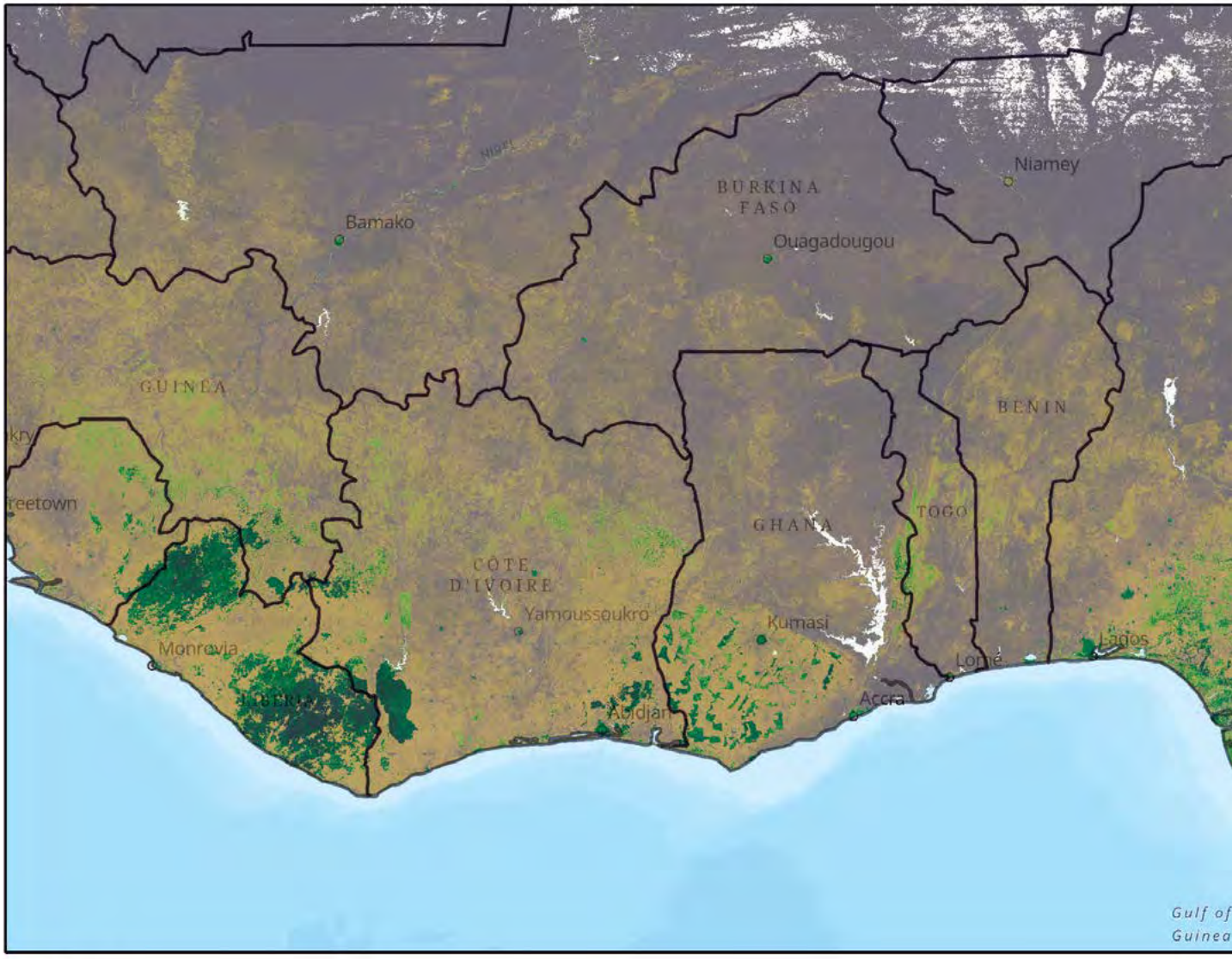
intra-annual temporal variations, and (ii) trends that are more long-term in nature.

The consequences of climatic anomalies can be analysed using the ASAP portal – Anomaly Hotspots of Agricultural Production – developed by the European Commission's Joint Research Centre (JRC) and available at the following website: https://agricultural-production-hotspots.ec.europa.eu/.

On a local level, the presence of the forest as a biotope is obviously conditioned by the characteristics of the climate. The overall maintenance of the forest will depend on the stability of temperature and precipitation values, their seasonality, and the frequency, amplitude and suddenness of variations. Apart from the occurrence of violent winds, which can have a direct impact on forest cover, variations in temperature and rainfall will have a greater impact on its balance and ecosystem functioning. The local, or microclimatic, analysis must also take into account energy transfers between the forest and the atmosphere, air humidity, evapotranspiration and air circulation. The states of these variables give rise to interlocking and highly interdependent circular phenomena. In other words, a local change in the characteristics of the climate can have an impact on the ecosystem functioning of the forest, and ultimately on its canopy cover, which in turn can have an impact on the local characteristics of the climate. Any consideration of the forest's resilience to climate change must therefore take into account these interdependent loops. The same applies when a forest regeneration or restoration process is planned. A detailed analysis of the relationship between vegetation and climate can be found in the chapter entitled 'Interactions between climatic characteristics and forests' in the book *Forêts et changements climatiques*.[13]

13 de Wasseige, C., Marshall, M., Mahé, G. and Laraque, A. (2015). Chapter 3. Interactions entre les caractéristiques climatiques et les forêts. In Les forêts du Bassin du Congo – Forêts et changements climatiques. Eds: de Wasseige, C., Tadoum, M., Eba'a Atyi, R. & Doumenge, C., Weyrich, Belgique. 128 p. https://www.observatoire-comifac.net/publications/edf/2015

FIGURE 18 Satellite image of West Africa showing the four most resilient forest blocks in the Guinean forests of West Africa: (i) northwest Liberia, (ii) southeast Liberia and the Taï National Park in Côte d'Ivoire, (iii) Ghanaian forests, and (iv) southern Nigeria. (© C. de Wasseige)

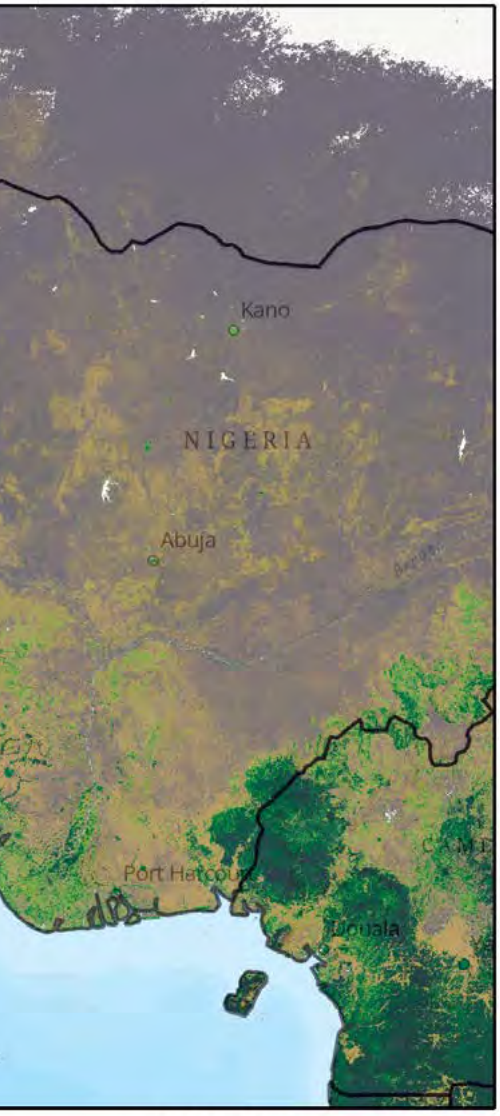


Source : www.globalforestwatch.org/map

Esri, Arne Bouv Gibb

It should therefore be remembered that the resilience of the forest in the face of climate change depends on the extent and speed of modifications to local-level climate characteristics, and on the forest's ability to adapt at the same time. Similarly, the maintenance of local climate characteristics will depend on the stability of the forest cover and the normal functioning of the ecosystem from a biophysical point of view. Changes in the forest cover therefore have an impact on the local climate, and vice versa: rapid changes of varying degrees in the characteristics of the climate can have an impact on the forests. These two phenomena clearly have very different timescales.

In the context of this analysis, it may be considered that climate change has little, none or a slow impact on the observed dynamics of change in forest cover. The causes must therefore be sought elsewhere. They are, of course, generally of an anthropogenic nature. The fact remains that large forest blocks of the original Guinean forest massif still exist. It is therefore worth asking what are the underlying reasons for the non-deforestation of these areas by man.



2.5.2
RESILIENCE TO ANTHROPOGENIC PRESSURES

According to a WWF report[14], the region is one of the 20 most active deforestation fronts on the planet. Finding forest massifs with a relatively intact forest cover means that they have to date been preserved from the threats that have wiped out other forest areas.

Taking into account the threats mentioned previously (Section 2.4), a more detailed analysis of the remaining forest blocks enables us to identify the main reasons why these blocks have been maintained. What are the criteria that have made these blocks resilient compared with other areas? To answer this question, we need to consider biogeophysical and human aspects. The limited appeal of these large blocks can often be explained by a combination of different criteria.

In terms of biogeophysical characteristics that have an influence on appeal, the following criteria should be pointed out:

- A geology that may offer exploitable mineral resources or, conversely, subsoils of little interest;
- Altitude and relief that can have a significant impact on ease of movement and accessibility to certain resources or areas;
- Soil fertility, which determines the attractiveness of the forest for converting it to another land use (e.g. agricultural plots). The forest thus constitutes a reserve of land;
- The intrinsic potential of forest resources for industrial exploitation.

In terms of the human characteristics of the appeal of forest massifs, the following should be mentioned:

- The presence of rail, road and/or river infrastructures, which influence the accessibility of the massifs and the possibilities for exporting products and 'importing' economic activities (particularly on an industrial scale);
- Population density, which also has a major impact on the dynamics of deforestation and degradation, particularly through subsistence farming and charcoal production;
- Governance and land use, particularly through regulations limiting the use of forest areas for economic or subsistence purposes.

14 Pacheco, P., Mo, K., Dudley, N., Shapiro, A., Aguilar-Amuchastegui, N., Ling, P.Y., Anderson, C. and Marx, A. (2021). *Deforestation fronts: Drivers and responses in a changing world.* WWF, Gland, Switzerland. 125 p.

Gola Rainforest National Park in Sierra Leone. (© RSPB)

For all these elements, the reader is invited to refer to the sub-sections of Section 2.4, which detail the threats to the forest.

The appeal of forests is not immutable. Certainly, in terms of the more bio-geophysical aspects, like a subsoil that is not very rich in minerals, apart from localised iron deposits (section 2.1.1), a rugged terrain, or poor soils, things change little over time. On the other hand, increases in population density, new infrastructures and a rise in temperatures that could, for example, push coffee growers to settle at higher altitudes, are more cyclical factors which could more quickly modify the appeal of the forest and the space it occupies.

2.5.3 LARGE RESIDUAL FOREST BLOCKS

It is easy to understand that the use of forests, to extract the products they contain or free up the space they occupy, starts with those that are the most appealing, i.e. those that require the least effort or investment, or are the best located. The corollary is that the residual forest blocks should be considered as the least appealing. While they remain subject to the threats listed above, the fact remains that destructive use has not taken place. Four major forest zones, or blocks, have been identified in the bioregions of the Guinean forests. Depending on their location, we can see a hierarchy of reasons for their being maintained.

LIBERIA'S NORTHWESTERN BLOCK

The forest block in northwest Liberia extends slightly into Guinea and Sierra Leone. Figure 8 shows that it is located in a predominantly rural area, whilst Figure 9 shows the dynamics of its forest cover loss over the last two decades. This forest block in northwest Liberia remains relatively intact thanks to a low population density in the surrounding area (Figure 4) and a rugged relief. Mountain ranges of medium altitude run in a southwest/northeast direction through the area. These do not favour the construction of transport networks (roads or railways), which pragmatically develop on the periphery of this forest block. The low population density and the terrain therefore appear to be the main factors for this forest block's resilience. In addition, the status of certain areas must be taken into account. In fact, some of the boundaries of this block correspond to the boundaries of protected or classified areas. This is particularly the case in Sierra Leone, with the two sections of the Gola Rainforest National Park, and in Guinea with the classified forest of the Ziama massif, which is being maintained despite its proximity to the town of Macenta. It should also be noted that this classified forest has a particularly rugged relief, with the presence of cliffs making access for exploitation difficult. Still in Guinea, and apart from the relief, a parallel can be drawn with the Diécké Forest Reserve. The boundaries of this massif correspond roughly to those of the classified forest, despite the proximity of a medium-sized town, Nzérékoré. The limited presence of mining resources or fertile soils (see Section 2.1.1) helps to make this block resilient, despite significant

View through the canopy in Taï National Park, Côte d'Ivoire. (© M. Languy)

deforestation in the area (Figure 9). It is also important to emphasise the effectiveness of a protected area's classification status, which in this zone has enabled the edges of the Ziama forest and the Diécké forest to be maintained.

LIBERIA'S SOUTHEASTERN BLOCK AND THE TAI NATIONAL PARK IN CÔTE D'IVOIRE

The forest block observed in southeastern Liberia extends into Côte d'Ivoire with the Taï National Park, despite the disappearance of the forest corridor between the two massifs. Like the previous block in western Liberia, this eastern block also benefits from a low population density (Figure 4). Figure 8 also shows that the population has been moving more towards urban centres in recent decades. The relief is relatively flat, in the form of a succession of hills. With the exception of the Putu Mountains, where the highest peak rises to 785 m, and a few other peaks above 500 m, this block extends between 0 and 400 m. The terrain, made up of low hills, does not therefore appear to be one of the factors that have contributed significantly to the resilience of this forest block.

There are four major protected areas in the block: two in Liberia (Sapo and Grebo-Krahn National Parks) and two in Côte d'Ivoire (Taï National Park and Cavally Forest Reserve). With the exception of the proposed Grand Kru-River Gee protected area, which is undergoing significant changes to its forest cover due mainly to an increase in subsistence farming around villages, the protected areas in the block play an important role in maintaining natural cover. In Liberia, the two national parks are still interconnected by forest areas, including a large forest concession (FMC-F (Forest Management Contract 'F'), providing a wooded continuum between the sites. This connectivity will largely depend on the maintenance of forest cover in this concession, and therefore on the application and monitoring of sustainable logging practices. On the northern side of the Grebo-Krahn National Park in Côte d'Ivoire, the Cavally Nature Reserve plays an important role in significantly increasing the forest under protection. The recent change in status of this forest (from classified forest to nature reserve, under the mandate of the Ivorian Office of Parks and Reserves (OIPR)) should increase opportunities for maintaining the forest cover of this area. The Taï National Park is a textbook case of the effectiveness of forest protection, having become an island of forest surrounded by entirely deforested zones. It will be important to work on reconnecting Taï and Grebo-Krahn, as mentioned in detail in Section 5.2.2. Generally speaking, national parks are an important guarantee for the preservation of forest cover and in particular for the resilience of this forest block.

Nevertheless, the block is under considerable pressure. Its periphery has some of the most dynamic deforestation rates in the region (Figure 9). On closer examination, it appears that it is the changes in Côte d'Ivoire in recent decades that have been the most intense, to the extent that some of the boundaries of this forest block coincide

*The yellow-headed picathartes (*Picathartes gymnocephalus*) is found mainly in rocky, high-altitude forest areas in West Africa, from Guinea to Ghana. (© M. Languy)*

with the border between the two countries. The southern part of the block is also active, with an increase and extension of urbanisation (Greenville, Barclayville, Fish Town), but above all it is the notable presence of the oil palm plantations of the Golden Veroleum Liberia company that have been the main cause of fragmentation to the natural habitats in the area.

The presence of a north-south road in Côte d'Ivoire, running along the border between the two countries, has also contributed to the disappearance of the nearby forest. In Liberia, there are few roads and they are currently underdeveloped (Greenville-Zwedru and Harper-Zwedru), but they still represent a major risk to the integrity of the block.

THE GHANAIAN FORESTS BLOCK

The Ghanaian forest block covers the southern third of the country plus a small part of the extreme southeast of Côte d'Ivoire. Figure 4 shows that the population density in southern Ghana is high compared with the previous two forest blocks. It also has a number of large built-up areas on its periphery (Abidjan, Kumasi, Accra, Sekondi-Takoradi) and towns under development within it (Obuasi, Prestea, Akim Oda, Dunkwa, Sunyani, etc.). It is slightly hilly, although here and there small mountain ranges, mostly oriented southwest/northeast, criss-cross the landscape, but they do not constitute a real obstacle to the development of transport networks. This forest block is at the heart of the cocoa production zone, which has been the main cause of deforestation (Section 2.4.1). Over the last two decades, Ghana has seen a strong dynamic of conversion from forest to other types of land use. In addition to cocoa cultivation, industrial agriculture such as palm oil production has also been responsible for a significant reduction in forest cover, particularly in the coastal part of the block. All the above factors mean that there is great pressure on the forest. The residual forest owes its survival exclusively to the total or partially protected status of certain areas throughout the block. In Ghana, today, there is an almost perfect correspondence between the boundaries of the areas under protection or communal management and the forest massifs. However, some forest conversion events have taken place recently. Part of the area of the Subri River Forest Reserve has been converted to oil palm plantations, and part of the Sui River Forest Reserve has been converted to cocoa cultivation. The same applies to the Mabi-Yaya Classified Forest and its neighbour, the Songan-Tamin forest in Côte d'Ivoire, which have been converted to rubber plantations. As a general

The Great Kwa River flows through Cross River State in southern Nigeria. (Chinedu Chime / Shutterstock)

rule, however, apart from these few notable incidents of deforestation in forests under protection status or communal management, governance that prohibits or limits the use of the forest seems to be playing its role effectively in this area.

NIGERIA'S SOUTHERN BLOCK

Nigeria is the most populous country in Africa, with 220 million inhabitants. The population is mainly concentrated in the large conurbations in the south (Lagos, Port Harcourt, Onitsha, etc.) and around Kano in the north (Figure 4). Demographic growth is having an impact on the southern Nigerian forest block (Section 2.4.1), which borders Cameroon, and consists of two high massifs separated by a valley some 15 km long. The block comprises the Cross River National Park, the Afi River Forest Reserve, the Cross River South and Cross River North Forest Reserves, the Oban-Group Forest Reserve, and a number of other forest and community reserves. Together with the national parks on the other side of the border (Korup National Park and Takamanda National Park), they form a fine group of montane forests. Unsurprisingly, within the block, it is in the valley that we find the main communication routes, in particular the road linking Ikom (Nigeria) to Mamfé (Cameroon), and the highest population densities. Unfortunately, the continuum of a natural forest ecosystem between the two massifs in Nigeria is now only ensured via Cameroon.

The pressure on the forest in this block is exerted by a nibbling effect due to the presence of humans, but also due to the installation of industrial plantations, particularly of oil palm in the southern massif along the Calabar-Ikom road and along the road that bypasses the massif to the west. Installed in the 2010s, these plantations have largely contributed to the high rate of deforestation on the periphery of the park. There are also a number of mining complexes (notably near Akankpa) on the periphery of the block.

The current resilience of the block is due in part to a large proportion of it having the status of a protected area, and in part to the high altitude and rugged relief. However, the foothills are increasingly occupied and the integrity of this cross-border forest region will depend above all on how the population is able to settle and how the economy will develop along the Ikom-Mamfé road axis.

3

STATE OF THE MAIN PROTECTED AREAS

3

STATE OF THE MAIN PROTECTED AREAS

Sapo National Park is Liberia's largest area of protected tropical forest and is the country's first national park. (© M. Languy)

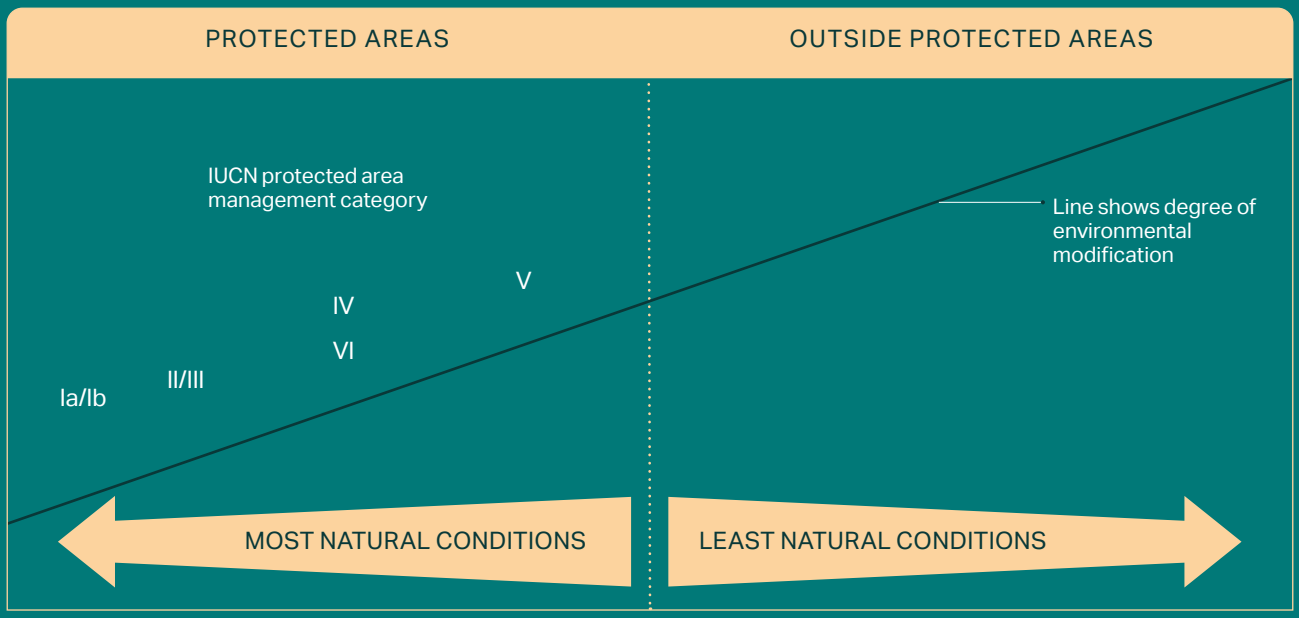
A protected area (PA) is defined by the International Union for the Conservation of Nature (IUCN) as 'a clearly defined geographical space, recognised, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature and its associated ecosystem services and cultural values'.

The criteria for identifying protected areas and their objectives have evolved along with the concept of conservation: from a very separatist vision (complete isolation) where protected areas were removed from all human activity and influence, to a more systemic and global vision, in which human populations are considered as one of the natural components of an ecosystem. Today, the different categories of protected areas make it possible for these visions to coexist. The IUCN has defined six different categories of protected areas, according to their conservation and management objectives.

The purpose of the network of protected areas, within the Guinean forests and at a global level, is to preserve a representative sample of natural ecosystems. This network must therefore meet several conditions:

1. **Representativeness:** within a geographical region or a country, the network of protected areas must represent a sample of the different existing natural environments, ideally proportional to their importance in terms of surface area.
2. **Adequacy:** the levels of preservation, number, total surface area, distribution and management activities of protected areas must enable the preservation of the environmental processes, habitats, communities and species that characterise the region/country.
3. **Synergy:** each protected area must contribute to the conservation and sustainable development objectives of the region/country.
4. **Consistency:** the classification of protected areas, their associated objectives and management policies must be implemented in a comparable manner according to a standardised system that is available, known and understandable by managers.
5. **Effectiveness and efficiency:** a balance must be struck between the costs and benefits of conservation actions, and their distribution between various stakeholders. This condition has been strongly emphasised in recent decades, with a greater involvement of indigenous peoples and local communities (IPLCs) in the management of protected areas, and a desire to redistribute some of the benefits (environmental and financial) of conservation to them.

FIGURE 19 Representation of protected area categories as per the IUCN, as a function of natural influences and human activities. Source: Dudley et al., 2008



SIDEBAR 16 THE DIFFERENT CATEGORIES OF PROTECTED AREAS

In 1978, the IUCN launched a process to facilitate the classification of areas managed for the conservation of nature or some of its components. The aim is to standardise the naming and description of protected areas throughout the world.

The IUCN classification is constantly evolving. It is based on the criteria that led to the area being designated for protection, the role of the PA in the overall landscape, the main conservation objectives, and the activities that are compatible or necessary to achieve them. Seven categories are defined, from Ia to VI, with an increasing level of preservation from the influence of human activities[a]. The IUCN categories are identical to those defined in the 2003 African Convention on the Conservation of Nature and Natural Resources.

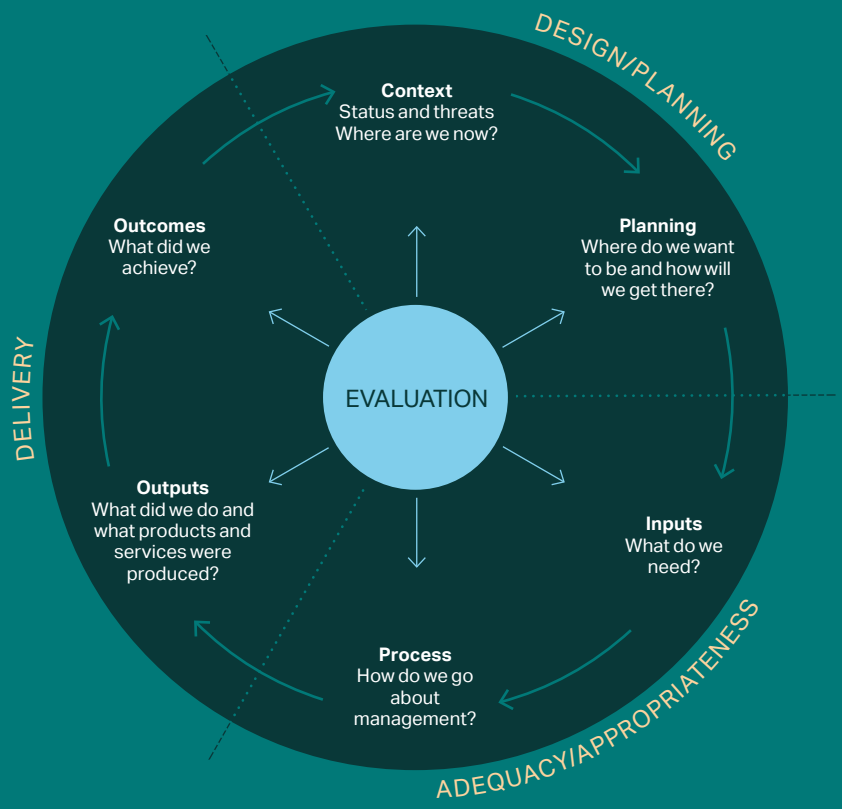
Despite this attempt at harmonisation, there are still national classifications whose terms and criteria do not follow those of the IUCN, which contributes to a certain complexity. In particular, the term 'national park' is often used for national designations without the protected areas concerned being recognised as belonging to the IUCN's category II. A protected area recognised as a national park at national level may therefore belong to different categories according to the IUCN, or not even be recognised according to this classification, which generates a certain amount of confusion.

a) Apart from category V (an area that has been shaped over the long term by interactions between human populations at a fairly high intensity and their environment) and VI (an area of an ecosystem that is conserved while allowing traditional, low-intensity use of natural resources by human populations), where category VI is often considered to be 'more natural' than category V.

TABLE 23 Classification of protected areas according to IUCN (adapted from Dudley et al., 2008)

IUCN Category	Type of protected area	Description and identification criteria	Objectives and authorised activities	Examples in the Guinean forests of West Africa
Ia	*Strict nature reserve*	Zone that is strictly protected for its biodiversity, its untouched and wild nature, and sometimes for its geological or geomorphological characteristics.	Strict protection of natural resources Scientific research	Mount Nimba Nature Reserve (Côte d'Ivoire and Guinea)
Ib	*Wilderness area*	Large zone, with limited or no modifications caused by human activities, and with preserved natural characteristics, including its biodiversity.	Tourism Traditional activities of the indigenous populations (low population density)	None in the Guinean forests of West Africa
II	*National park*	Large natural or quasi-natural zone in which large-scale ecological functions and characteristic species and ecosystems are preserved.	Scientific, cultural, educational, leisure and touristic activities	Outamba-Kilimi National Park
III	*Natural monument*	Zone of usually limited size, protected to preserve a natural monument (specific type of terrain, submarine seascape or geological element, such as a cave or an underwater cave, a living element such as a forest).	Scientific, cultural, educational, leisure and touristic activities	Tano Ofin Forest Reserve (Ghana)
IV	*Habitat/species management area*	Zone defined to protect a specific species or habitat, the preservation of which often requires regular interventions.	Management activities that contribute to the protection of the target species or habitat	Afi Mountain Wildlife Sanctuary (Nigeria)
V	*Protected landscape/ seascape*	Zone which over a long period of time has been shaped by the interactions between natural elements and human populations, which produced specific ecological, biological, cultural or scenic characteristics.	Activities intended to preserve the key interactions of the zone	Afi River Forest Reserve (Nigeria)
VI	*Protected area with sustainable use of natural resources*	Zone that preserves an ecosystem, despite the fact that it is utilised by human populations for cultural usages and for its natural resources. PAs in this category are often large, with a significant portion in natural condition and a portion submitted to low-intensity human activities.	Sustainable use and management of natural resources at non-industrial levels	Kambui Hills Forest Reserve (Sierra Leone)

FIGURE 20 Conceptual diagram of the protected area management effectiveness analysis cycle (source: https://www.protectedplanet.net/en/thematic-areas/protected-areas-management-effectiveness-pame?tab=Methodologies)



SIDEBAR 17 **IMET: A TOOL FOR THE MONITORING AND ASSESSMENT OF PROTECTED AREAS**

IMET is a protected area monitoring tool, developed initially for Central and West Africa by the Central Africa Forest Observatory (*Observatoire des forests d'Afrique Centrale*, OFAC) within the framework of the Biodiversity and Protected Areas Management (BIOPAMA) programme. It was launched in 2015.

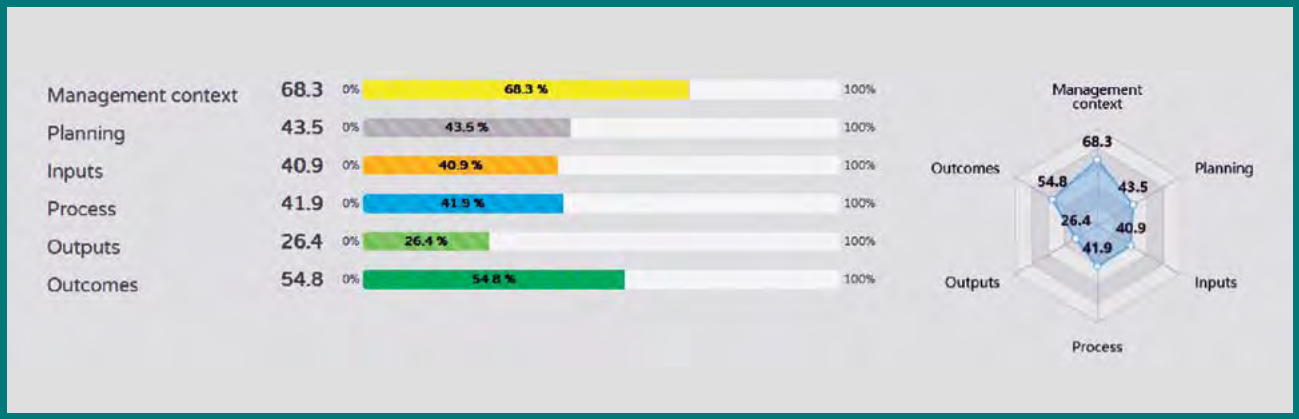
The objective of IMET is to measure the efficiency of the management of a PA via an internal evaluation carried out by the protected area's managers, with the support of experts who help in the utilisation of the tool. Data collection is participative: it mobilises knowledge from the managers, information from reference documents, as well as contributions from other stakeholders such as local communities in the protected area and scientific researchers working in the region.

An open access tool has been developed to facilitate the coding and analysis tasks. Automated data processing enables comparison of the results versus targets in order to assess management efficiency. Indicators have been defined to report on the various aspects of the protected area's management. They enable identifying the strengths, weaknesses, opportunities and threats (SWOT) of the management and facilitate the design and implementation of adaptive management practices in order to improve the least performing elements and reach the planned objectives. Moreover, this automation process facilitates the comparison between the results obtained over time and the progress made.

This is a three-step approach:

1. **Information collection and encoding.** Information is structured into seven different headings: (i) general information on the protected area, (ii) surface areas, shape indexes and control levels, (iii) human, financial and material resources, (iv) key elements (animal species, plant species, ecosystems and habitats), (v) pressures and threats, (vi) climate change and conservation, and (vii) ecosystem services and dependency of the communities (and of society). Objectives must be defined for each heading, together with the indicators that enable their achievement to be evaluated.

FIGURE 21 Example of a graph provided in the IMET analysis report for a protected area. It indicates the completion level of the objectives defined in the different assessed elements and highlights elements on which efforts must be targeted in order to improve the conservation and effectiveness of the protected area (source: Nzigiyimpa, L. (2022). Management Effectiveness of East Nimba Nature Reserve, IMET Baseline Assessment 2022 Report)



2. **Management effectiveness assessment** This step follows the protected area management effectiveness analysis cycle proposed by Hockings (Figure 20). This assessment involves six elements: (i) management context, (ii) planning, (iii) means and resources employed (inputs), (iv) management process (which utilises internal management, relationships with stakeholders, tourism, scientific research, and monitoring), (v) results achieved, and (vi) resulting effects and impacts. The analysis of each element can be visualised as graphics that display and synthesise the results.
3. **Analysis report.** This report provides the main analysis results of the protected area's management as per the different elements, and establishes a link with the data provided by international observatories, for example the Digital Observatory for Protected Areas (DOPA)[a] and Copernicus Land Services[b]. It comprises a mapping of the protected area, using the conservation and threats elements, as well as the management effectiveness evaluation indicators. It also comprises a SWOT analysis, together with operational recommendations and priorities.

As such, IMET analysis makes it possible to determine the priority interventions needed to achieve the conservation objectives of a protected area, factoring in its context and its condition at the time of the evaluation. Should a development and management plan (PAG) be lacking, which unfortunately is still the case for almost half of the West African PAs, another added value of an IMET evaluation is the identification of the main lines (value, threats, key activities to be implemented) that constitute the basis for developing a PAG.

The tool can be downloaded from the following website: https://www.observatoire-comifac.net/imet/download

a) European Commission's Digital Observatory for Protected Areas: https://dopa-explorer.jrc.ec.europa.eu/
b) European Commission's Earth Observatory: https://www.copernicus.eu/fr

SIDEBAR 18 THE WORLD DATABASE ON PROTECTED AREAS (WDPA) AND PROTECTED PLANET WEBSITE

The World Database on Protected Areas (WDPA) is the most exhaustive global database on marine and land protected areas. Launched in 2020, this United Nations Environment Programme (UNEP) and IUCN joint project is managed by the World Conservation Monitoring Centre (WCMC). The data supplied to the WDPA is collected by governments, NGOs, universities and businesses.

A dedicated website – Protected Planet – enables users to gain access to and download regularly updated data, and to interact with and enrich the WDPA database: https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA

Other sections of the site are dedicated to monitoring initiatives for the management of protected areas, including IMET and the spatial monitoring and reporting too (SMART), and to other forms of territorial management such as other effective (area-based) conservation measures (OECMs) and territories and areas conserved by indigenous peoples and local communities.

With regards to the achievement of their objectives, the efficiency of the protected areas must be evaluated at regular intervals, in order to allow for their management methods to be adapted and for the preservation of the resources in the area to be guaranteed. Different tools have been developed to that effect. However, the number of existing tools in use is high and, currently, there is no assessment method applied in a systematic way in all protected areas. In West Africa, the Integrated Management Effectiveness Tool (IMET) is used in a large number of protected areas.

A total of almost 600 PAs have been established in the Guinean forests of West Africa. They cover approximately 20 % of the initial surface area of the biome in West African forest countries; yet most of these protected areas are small with a low conservation status (forest reserves).

Although only the PAs that belong to the categories defined by the IUCN and reported by countries are taken into consideration, the Guinean forests today include 198 protected areas that cover a total surface area of 36 660 km², only 7.7 % of the biome in the forest countries of West Africa. However, it should be noted that numerous PAs are missing from the WDPA, probably because they have not been reported by countries: the Sapo National Park, the Gola Forest National Park and the Grebo-Krahn National Park in Liberia, for example, or even the Diécké Classified Forest in Guinea (Table 24). In terms of surface area, the percentages of protected Guinean forest in the forest countries of West Africa vary significantly: from 8.7 % in Guinea to 31 % in Côte d'Ivoire, and from 0 % in Liberia to 20.3 % in Ghana, if one is to consider only the IUCN categories. Unfortunately, these analyses do not take into account PAs that have been impacted by deforestation.

The present document focuses on protected areas that have been taken into consideration within the framework of the PAPFor programme, as well as seven additional protected areas selected on the basis of their contribution to the protection of the biodiversity of Guinean forests, their preserved forest characteristics and their large surface area (Table 25). Each of these protected areas is described in a way that includes its main characteristics, the threats it faces, and the recommendations and action priorities needed in coming years to meet its conservation objectives.

TABLE 24 Number and surface area (in km²) covered by protected areas in the Guinean forests of West Africa

IUCN category	Côte d'Ivoire		Ghana		Guinea		Liberia		Nigeria		Sierra Leone		Total forests in West Africa	
	Number	Surface	Number	Surface	Number	Surface	Number	Surface	Number	Surface	Number	Surface	Total number of PAs	Total surface of PAs
Ia	2	80			1	136							3	216
II	6	7 695	4	1 042					3	10 308	4	1 358	17	20 404
III			43	3 845									43	3 845
IV	1	280	52	4 837					1	312	1	13	55	5 442
V			4	214								4	4	214
VI			75	6 326							1	213	76	6 539
IUCN sub-total	9	8 055	178	16 264	1	136	0	0	4	10 619	6	1 584	198	36 660
Outside IUCN* category	2	3 676			1	194						3	3	3 870
Undeclared IUCN category	131	34 373	1	18	45	3 923	13	10 200	151	19 735	23	3 027	364	71 276
Total	142	46 105	179	16 282	47	4 254	13	10 200	155	30 355	29	4 611	565	111 806
Guinean forest surface area		148 853		80 099		48 821		95 547		128 001		47 624		548 945
% of Guinean forests under IUCN protection		5,4		20,3		0,3		0,0		8,3		3,3		6,7
% of Guinean forests under protection		31,0		20,3		8,7		10,7		23,7		9,7		20,4

* *For Côte d'Ivoire and Guinea, the 193 ha Mount Nimba Integral Nature Reserve, which straddles the two countries, is counted in each, so is taken into account twice in the totals for number and surface area. In the table above, certain protected areas identified do not appear as belonging to the IUCN categories since they are not listed in the WDPA database. This is the case for Sapo National Park, Gola Forest National Park and Grebo-Krahn National Park in Liberia, and Diécké Classified Forest in Guinea. Instead they appear in the 'Undeclared IUCN category' row.*

Source: WDPA, 2023

FIGURE 22 Main forest protected areas in West Africa

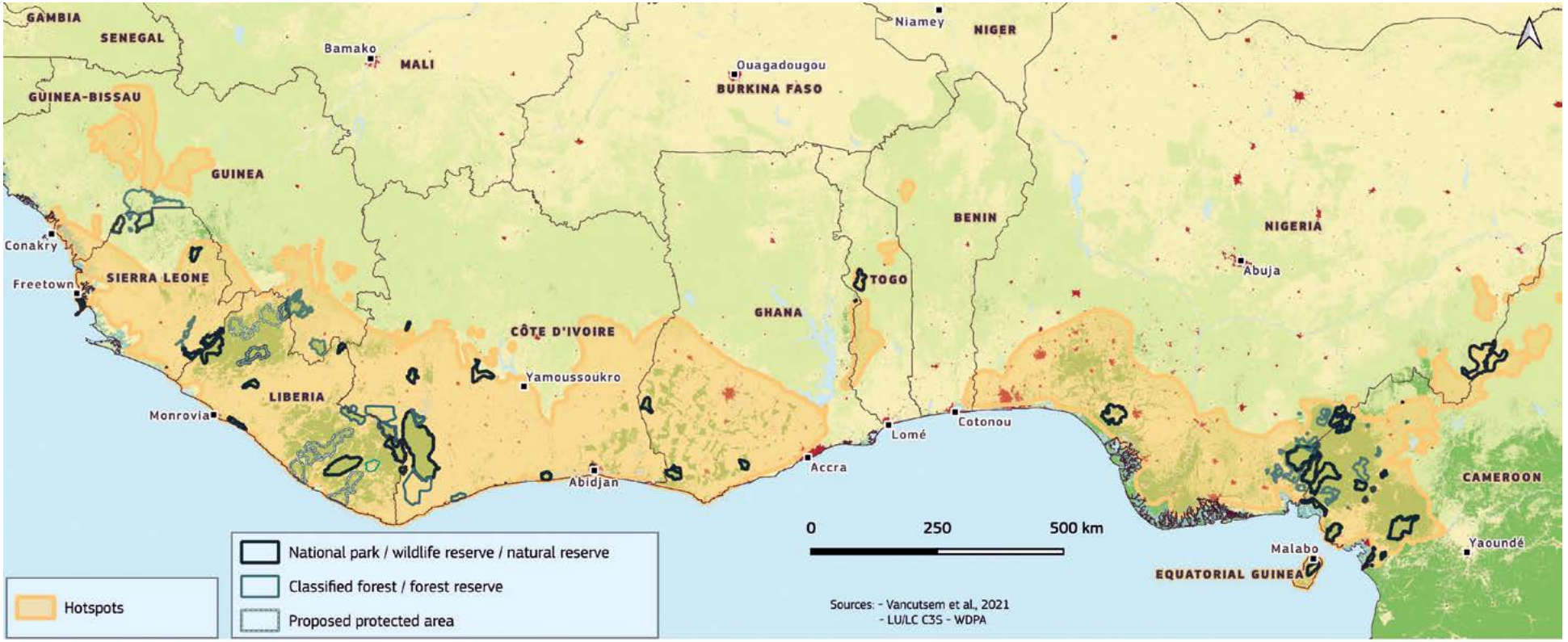


TABLE 25 List of protected areas described in this document

Priority landscapes of the PAPFor programme	Country	Conservation zones
1. Outamba - Kilimi - Kuru Hills - Pinselli - Soyah (OKKPS)	Sierra Leone	Outamba-Kilimi National Park
	Sierra Leone	Kuru Hills Forest Reserve
	Guinea	Pinselli Classified Forest
	Guinea	Soyah Classified Forest
	Guinea	Sabouyah Wildlife Reserve
2. Gola - Foya - Lofa (Gola)	Sierra Leone	Gola Rainforest National Park
	Sierra Leone	Kambui Hills Forest Reserve
	Sierra Leone	Tiwai Island Wildlife Sanctuary
	Liberia	Gola Forest National Park
	Liberia	Foya-Gbarlo National Park Proposed Protected Area
3. Wologizi - Wonegizi - Ziama (WWZ)	Guinea	Ziama Biosphere Reserve
	Liberia	Wologizi Proposed Protected Area
	Liberia	Wonegizi Proposed Protected Area
4. Mount Nimba (Nimba)	Guinea	Mount Nimba Nature Reserve
	Guinea	Bossou Hills Strict Nature Reserve
	Liberia	East Nimba Nature Reserve
	Côte d'Ivoire	Mount Nimba Integral Nature Reserve
5. Taï - Grebo-Krahn - Sapo (TGKS)	Côte d'Ivoire	Taï National Park
	Côte d'Ivoire	N'Zo Wildlife Partial Reserve
	Liberia	Grebo-Krahn National Park
	Liberia	Sapo National Park
	Liberia	Krahn-Bassa Proposed Protected Area – Kwa National Park
6. Cross River	Nigeria	Cross River National Park
	Nigeria	Afi River Forest Reserve
	Nigeria	Afi Mountain Wildlife Sanctuary
	Nigeria	Cross River South Forest Reserve
Outside PAPFor landscapes	Côte d'Ivoire	Banco National Park
	Côte d'Ivoire	Cavally Nature Reserve
	Ghana	Ankasa Wildlife Reserve
	Ghana	Kakum National Park
	Guinea	Diécké Classified Forest
	Nigeria	Okomu National Park
	Sierra Leone	Western Area Peninsula National Park

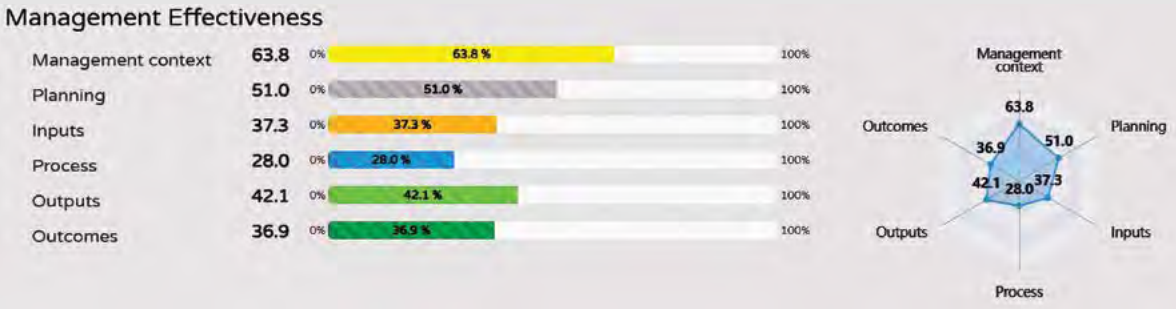
3.1 OUTAMBA - KILIMI - KURU HILLS - PINSELLI - SOYAH (OKKPS)

SIERRA LEONE

OUTAMBA-KILIMI NATIONAL PARK

Outamba-Kilimi National Park
Catégorie II, parc national
Creation date: 1995
Area: 738 km² (Outamba) and 388 km² (Kilimi)

PA manager: National Protected Area Authority (NPAA)
Development and management plan not available (expected in 2025)
Last IMET evaluation: September 2024
Last IMET score: index 43.19

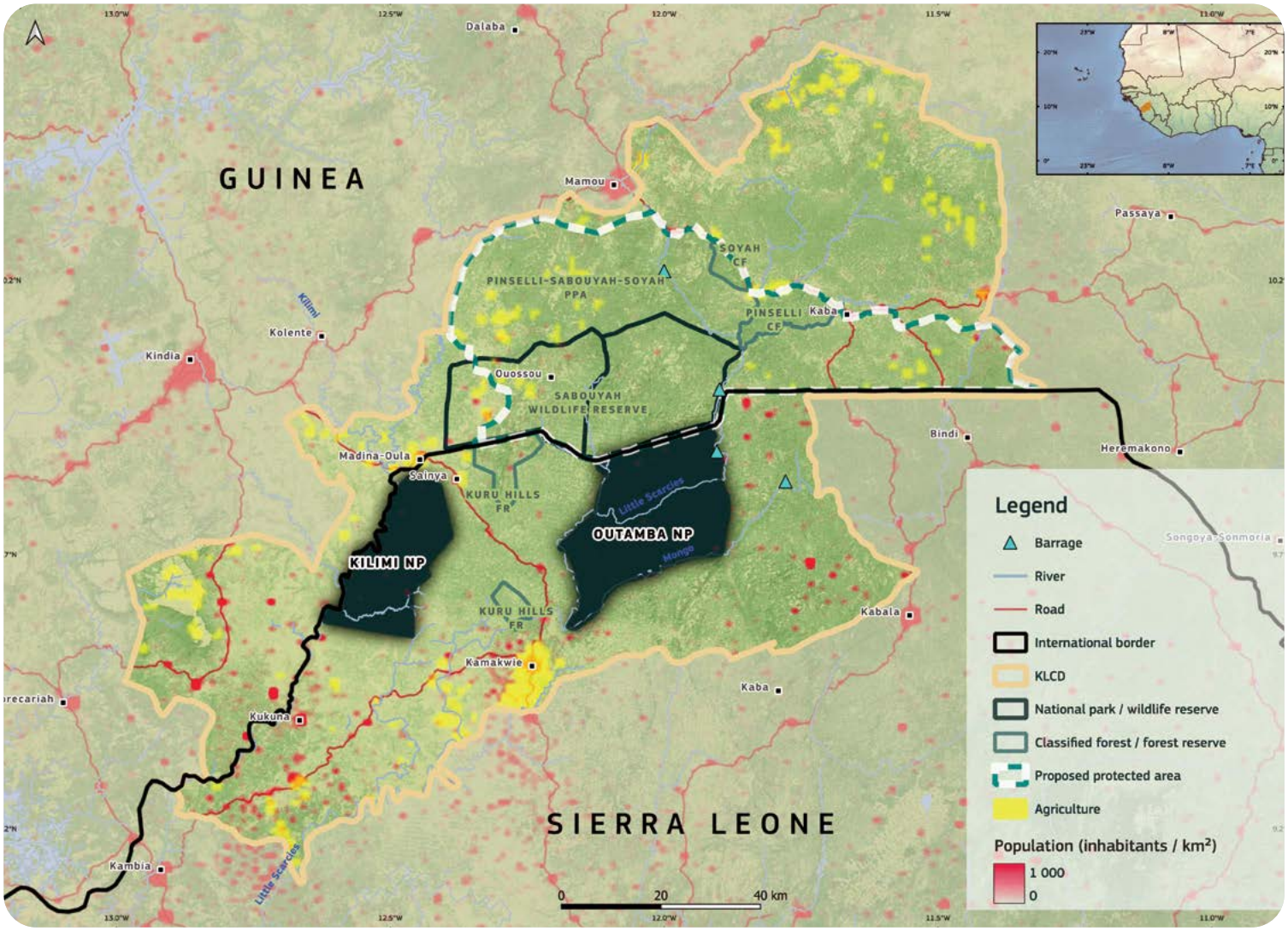


MAIN HABITATS: The Outamba-Kilimi National Park (NP) belongs to the Sudano-Guinean savannahs. It comprises a mosaic of lowland rainforests, wooded savannahs, gallery forests and riparian ecosystems along waterways. In Outamba, tall grass savannah and wooded savannah dominate, with isolated fragments of dense forest, whereas in Kilimi the Guinean wooded savannah is the main vegetal formation. Raffia marshes are found in both parks.

KEY SPECIES (FAUNA, FLORA): The park is host to the western chimpanzee (*Pan troglodytes verus*), common hippopotamus (*Hippopotamus amphibius*) in riparian ecosystems, forest elephant (*Loxodonta cyclotis*), leopard (*Panthera pardus*), Chad buffalo (*Syncerus brachyceros*), Maxwell's duiker (*Philantomba maxwellii*) and water chevrotain (*Hyemoschus aquaticus*). Other species of primates are present, such as the western red colobus (*Piliocolobus badius*), king colobus (*Colobus polykomos*), and sooty mangabey (*Cercocebus atys*). The avian fauna is also highly diverse, with more than 200 species identified, including several species endemic to West Africa: the pied-winged swallow (*Hirundo leucosoma*), turati gonolek (*Laniarius turatii*), emerald starling (*Lamprotornis iris*), and the Togo paradise whydah (*Vidua togoensis*). Moreover, the park is a habitat for several species usually found in dense rainforests, within the gallery forests on the banks of large rivers.

OTHER CONSERVATION VALUES: In 2001, the Outamba-Kilimi National Park was declared an important bird area.

MAIN THREATS: The Outamba-Kilimi NP is negatively impacted by human population growth and the increase of anthropic activity. Illegal hunting is widely practised, especially in Kilimi, targeting endangered species (elephant, chimpanzee) and other primates. Unsustainable



fishing is also practised, using small, mesh fishing nets or poison that contaminates the aquatic ecosystem. Fires are used to clear land for agriculture and animal breeding, but this land conversion causes degradation and deforestation. Artisanal gold mining and the exploitation of African rosewood (*Pterocarpus erinaceus*) are major threats within the Outamba park where large zones of illegal logging have taken place in the last few years.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Specific actions for the conservation of the ecosystems within the two national parks, as well as the preservation of the forest corridor that separates them, which corresponds to the Kuru Hills Forest Reserve, would contribute to the ecological viability of the zone. The implementation of an international, collaborative management of the natural ecosystems located at the border with Guinea, within the framework of a landscaping approach, would benefit the movements of animal populations, such as forest elephant, that occupy large vital domains. This collaboration would also contribute efficiently to the struggle against poaching and bushfires, and the expansion of pasture zones for animal farming. The creation of African rosewood plantations for commercial purposes at the periphery of the park would make it possible to control deforestation in the park on the one hand, and to ensure stable incomes for the local communities on the other.

The materialisation of the boundaries of the parks in the Outamba-Kilimi complex would facilitate exchanges with the local communities within the framework of land-use planning. To this end, a coherent and durable solution would be the zoning of the OKNP complex, including the high conservation value (HCV) zones, connectivity zones and land use.

*A king colobus (*Colobus polykomos*) in the Kuru Hills Forest Reserve, Sierra Leone. (© M. Languy)*

SIERRA LEONE

KURU HILLS FOREST RESERVE

Kuru Hills Forest Reserve
Currently not recognised by the IUCN
Creation date: 1955
Area: 70 km²

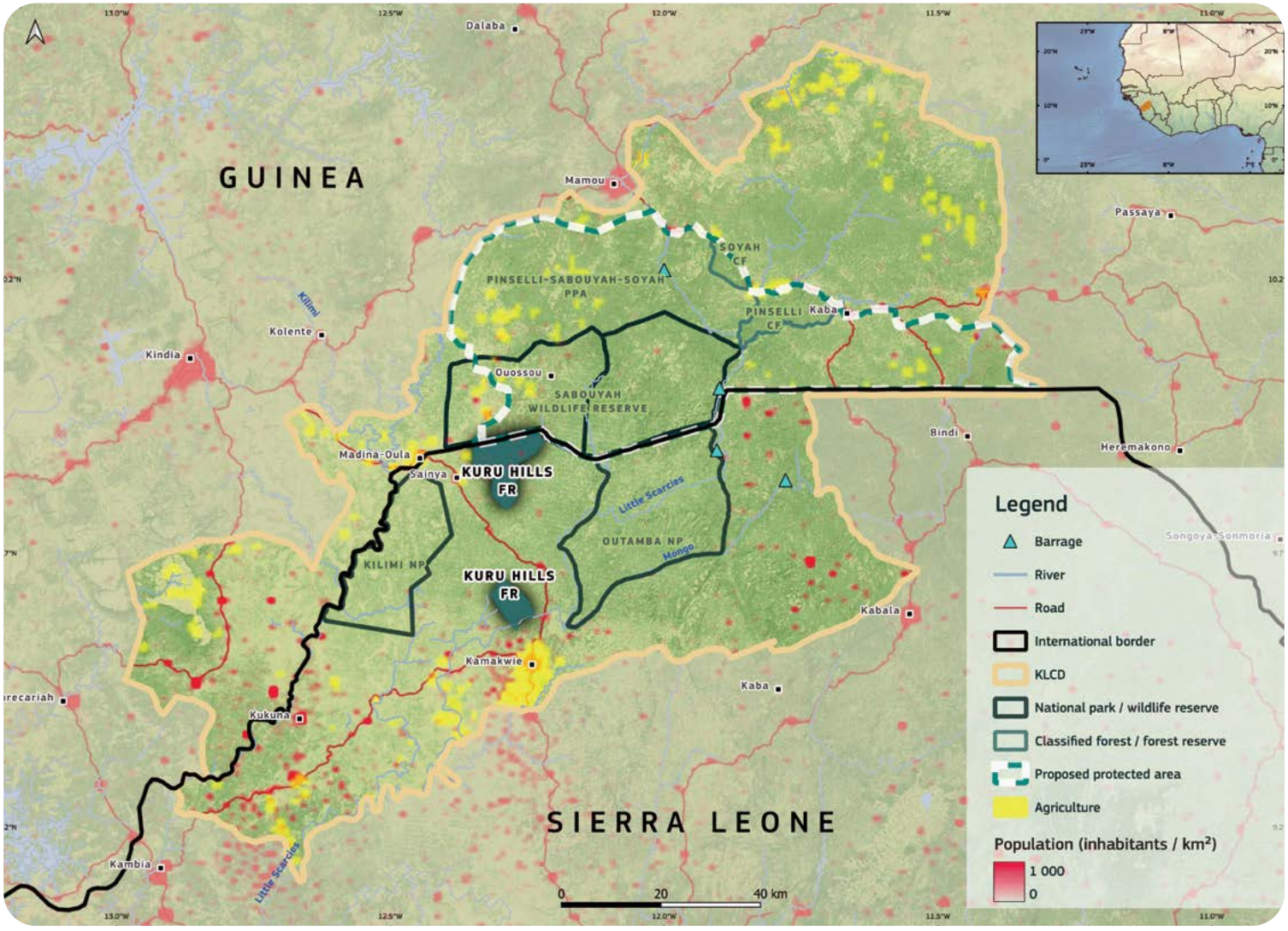
PA manager: National Protected Area Authority (NPAA)
Development and management plan planned for 2025

MAIN HABITATS: The Kuru Hills Forest Reserve is composed of dense rainforest populated with deciduous or semi-deciduous species with savannahs forming its western boundary. The species *Terminalia glaucescens* and *Piliostigma thonningii* are frequent. The hills can reach 700 metres above sea level.

KEY SPECIES (FAUNA, FLORA): The African rosewood (*Pterocarpus erinaceus*) is a species characteristic to the Kuru Hills Forest Reserve. This endangered tree, a quality timber species, has recently been added to Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

MAIN THREATS: Logging is a significant threat to the forests that cover the Kuru Hills, albeit less severe than in the plains because of the steep slopes and zones that are hard to access. The Kuru Hills Forest Reserve is thus basically preserved from agricultural activities. Occasional seasonal fires develop in connection with cattle rearing by Guinean livestock farmers. There is also a strong invasion of *Gmelina arborea*, an exotic Asian wood species.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The productivity and the stability of the ecosystem could be improved through the development of participative management of natural resources with the involvement of local communities. The efficacy of the reserve's protection could also be improved through the implementation of a development and management plan, and possibly the increase of the Kuru Hills Forest Reserve's conservation status.


GUINEA
SIERRA LEONE
Dalaba
Mamou
Passaya
Kolente
Kindia
Kilimi
Ouossou
SOYAH CF
PINSELLI-SABOUYAH-SOYAH PPA
PINSELLI CF
Kaba
SABOUYAH WILDLIFE RESERVE
Madina-Oula
Sainya
KURU HILLS FR
KILIMI NP
KURU HILLS FR
Little Scarcies
OUTAMBA NP
Mongo
Bindi
Heremakono
Songoya-Sonmoria
Kabala
Kamakwie
Kaba
Kukuna
Kambia
Little Scarcies
0
20
40 km
Legend
Barrage
River
Road
International border
KLCD
National park / wildlife reserve
Classified forest / forest reserve
Proposed protected area
Agriculture
Population (inhabitants / km²)
1 000
0

GUINEA

PINSELLI CLASSIFIED FOREST

Forêt classée de Pinselli
Currently not recognised by the IUCN, but proposed for inclusion in category II, national park (Pinselli-Soyah-Sabouyah National Park)
Creation date: 1945
Area: 120 km²

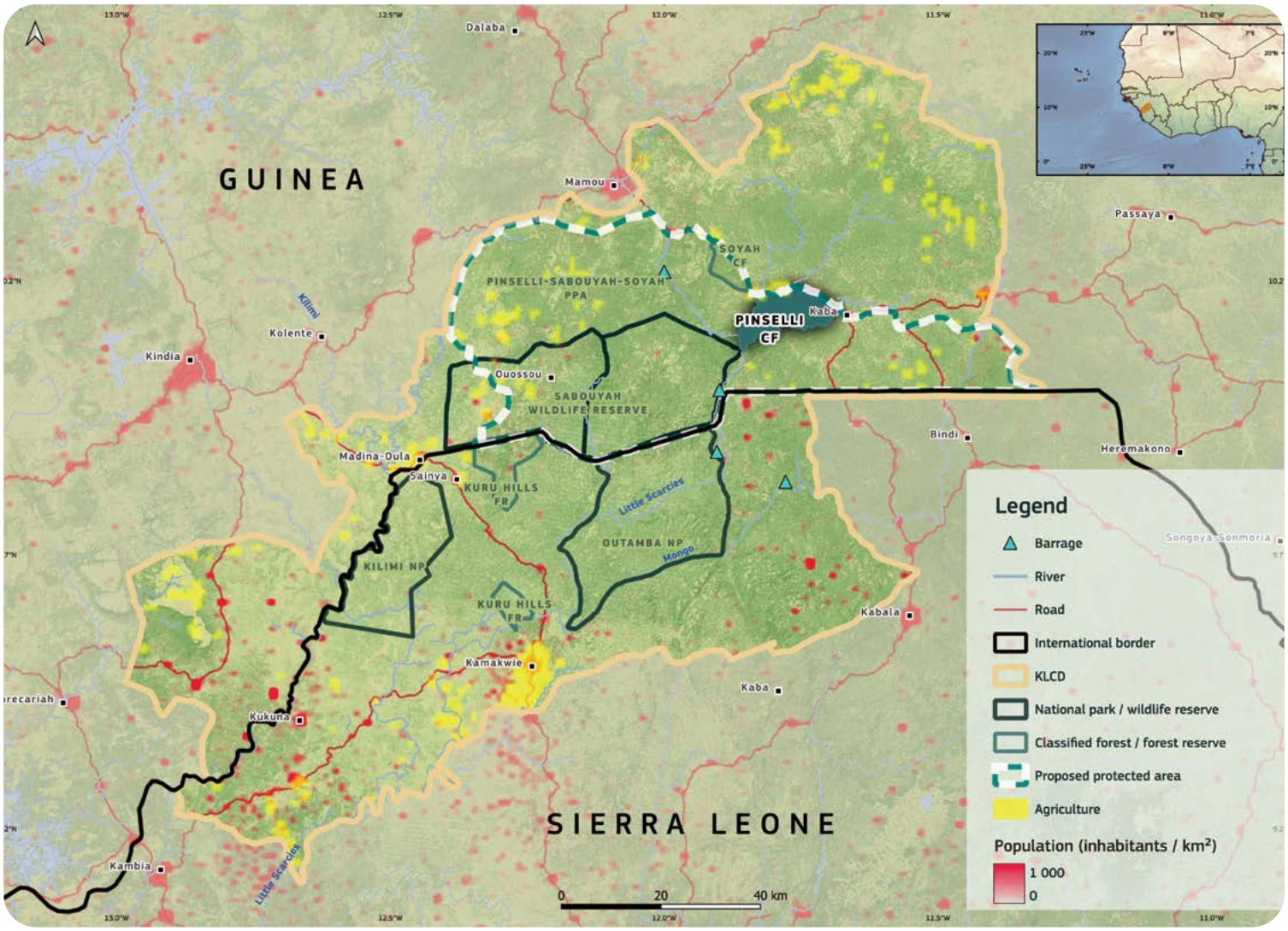
PA Manager: *Office Guinéen des Parcs Nationaux et Réserves de Faune (OGPRF)*
Development and management plan not available
Last IMET evaluation in October 2023
IMET index: 50.7

MAIN HABITATS: The Pinselli Classified Forest is marked by severe degradation, except for the gallery forests on the banks of the Kaba and Pinselli rivers. The characteristic wood species present in the residual forests are *Afzelia africana*, *Erythrophleum suaveolens* and *Khaya senegalensis*.

KEY SPECIES (FAUNA, FLORA): The fauna community is also fairly poor, although certain emblematic species are still present: the western chimpanzee (*Pan troglodytes verus*), hippopotamus (*Hippopotamus amphibius*), patas monkey (*Erythrocebus pataspatas*), warthog (*Phacochoerus africanus*), and several species of pangolins (*Smutsia gigantea, Phataginus tricuspis*), colobus, monkeys and duikers. Elephant (*Loxodonta cyclotis*) could still be present. The avian fauna includes species of interest such as the white-backed vulture (*Gyps africanus*), hooded vulture (*Necrosyrtes monachus*), and white-headed vulture (*Trigonoceps occipitalis*).

OTHER CONSERVATION VALUES: The Pinselli Classified Forest is a pilot site for the implementation of the 2020-2030 National Plan for the conservation of Guinean chimpanzees. It also has a marked importance for the supply of ecosystem services to the region's local populations.

MAIN THREATS: The Pinselli Classified Forest was open to big game hunting in the 1930s. This led to the extermination of a large portion of the fauna, and the remaining populations are still under pressure. Commercial logging contributes to the degradation of the forests. Demographic growth in the Madina Oula, Ouré Kaba, and Mamou zones increases the pressure generated by human activities. A railway line project threatens the Pinselli-Soyah-Sabouyah zone. The opening of roads to link the zone to large agglomerations, as well as uncontrolled bushfires, already causes deforestation.



RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Merging of the Pinselli and Soyah classified forests with the Sabouyah Wildlife Reserve into a single and larger protected area would improve their conservation potentials. This is in progress as part of the recognition of the Pinselli-Soyah-Sabouyah NP. A better knowledge of the fauna and flora in this zone would make it possible to achieve better control of conservation actions. It is also necessary to reinforce monitoring activities and provide the park (or the three protected areas) with human and financial means, as well as the necessary infrastructures. Collaboration with local communities is also essential, especially through the development of income-generating activities compatible with conservation, the development of a sustainable management strategy for cattle breeding, and the implementation of environmental education and awareness raising programmes.

Mitigation measures for the negative impacts caused by the development of railway infrastructure must be implemented and applied to guarantee the survival of the biodiversity in the Pinselli-Soyah-Sabouyah zone.

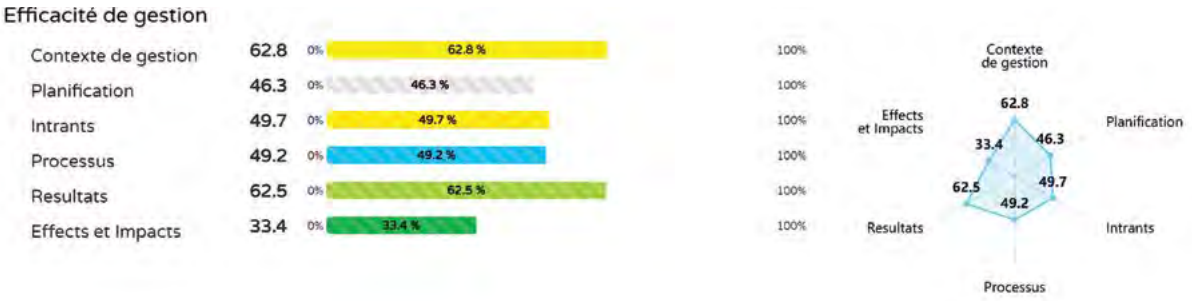
*An anteater bulbul (*Bleda canicapillus*) in the Soyah Classified Forest, Guinea. (© M. Languy)*

GUINEA

SOYAH CLASSIFIED FOREST

Forêt classée de Soyah
Currently not recognised by the IUCN, but proposed for inclusion in category II, national park (Pinselli-Soyah-Sabouyah National Park)
Creation date: 1945
Area: 72 km²

PA Manager: *Office Guinéen des Parcs Nationaux et Réserves de Faune* (OGPRF)
Development and management plan not available
Last IMET evaluation: October 2023
IMET index: 50.7



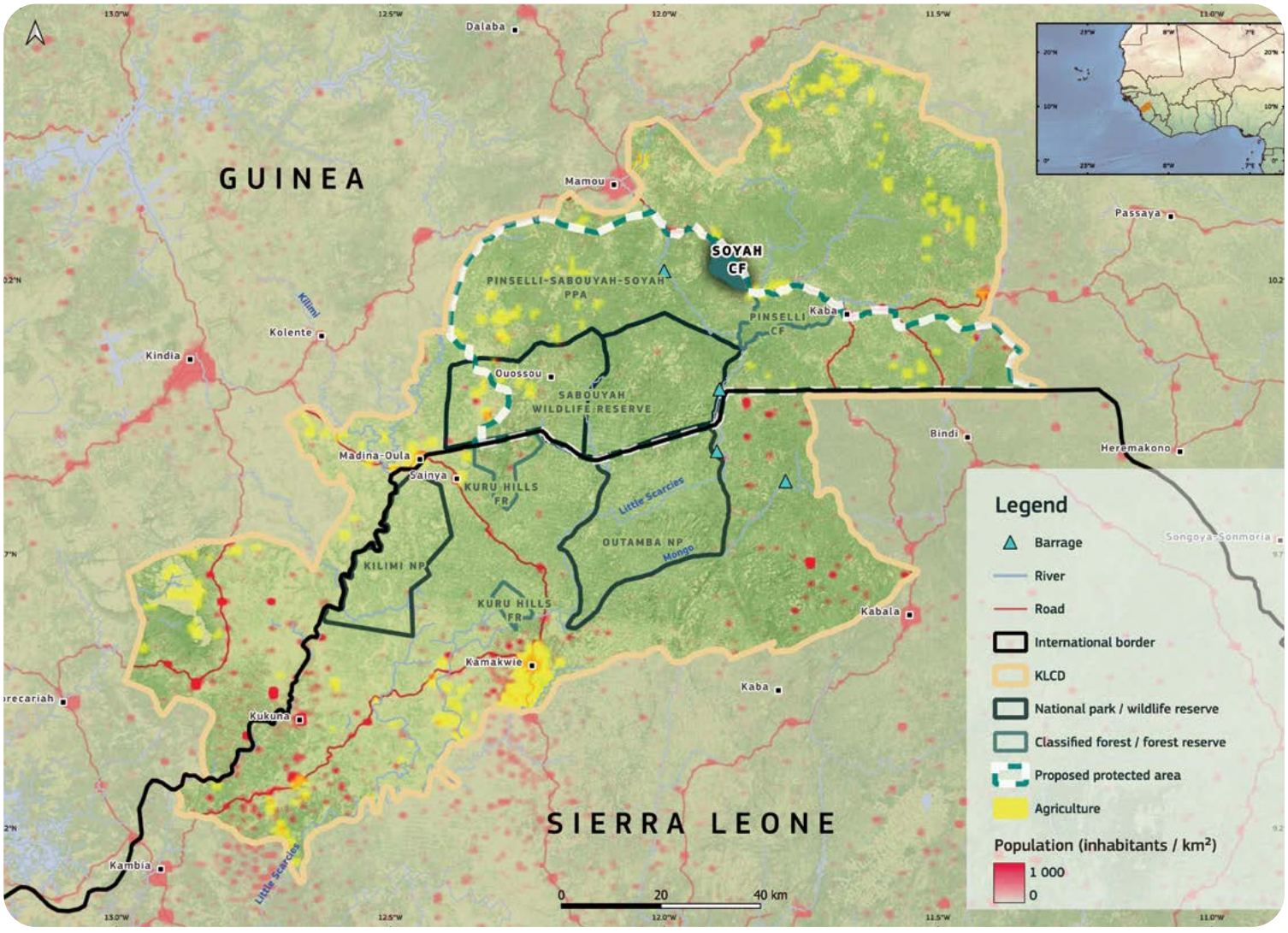
MAIN HABITATS: The Pinselli-Soyah-Sabouyah region is composed of dense secondary rainforest, gallery forests along the banks of waterways, and more open canopy forest. Agricultural plots of land can also be found.

KEY SPECIES (FAUNA, FLORA): Very close to Pinselli, the Soyah Classified Forest is host to populations of western chimpanzee (*Pan troglodytes verus*), pangolin (*Smutsia gigantea* and *Phataginus tricuspis*), dwarf crocodile (*Osteolaemus tetraspis*) and large carnivores (*Panthera pardus* and *Caracal aurata*).

OTHER CONSERVATION VALUES: This forest hosts a significant number of species endemic to the Guinean forest and species endemic to the Sudanese savannahs. Hence, it is a transition zone of specific importance within the context of climate change, especially to carry out research on the dynamics of several species at the boundaries of their distribution. Moreover, the forest includes rivers that hold economic and/or social values for their communities.

MAIN THREATS: Several villages surround the Soyah Classified Forest. Human activities that threaten its conservation include mainly the conversion of forest zones into farming plots or pastures, and the hunting and poaching of animal species. The reserve is regularly threatened by bushfires during the dry season.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Besides the integration of the Soyah Classified Forest into the future Pinselli-Soyah-Sabouyah NP, monitoring efforts and actions to counter illegal activities are also important. In order to contribute to their effectiveness, it is also necessary to work with the local village populations to implement the sustainable management of natural resources: organisation of nomadic pastoralism in the park's area of influence, support for sustainable farming activities, implementation of a bushfire management strategy, etc. In view of the high number of villages in the region, it is essential that a management plan be designed together with the local people.


GUINEA
SIERRA LEONE
Dalaba
Mamou
Passaya
SOYAH CF
PINSELLI-SABOUYAH-SOYAH PPA
PINSELLI CF
Kaba
Kolente
Kindia
Kilimi
Ouossou
SABOUYAH WILDLIFE RESERVE
Bindi
Heremakono
Madina-Oula
Sainya
KURU HILLS FR
Little Scarcies
OUTAMBA NP
Mongo
KILIMI NP
KURU HILLS FR
Kabala
Kamakwie
Kukuna
Kambia
Songoya-Sonmoria
0
20
40 km
Legend
Barrage
River
Road
International border
KLCD
National park / wildlife reserve
Classified forest / forest reserve
Proposed protected area
Agriculture
Population (inhabitants / km²)
1 000
0

GUINEA

SABOUYAH WILDLIFE RESERVE

Réserve de faune de Sabouyah
Currently not recognised by the IUCN, but proposed for inclusion in category II, national park (Pinselli-Soyah-Sabouyah National Park)
Anticipated creation date: 2026
Area: 250 km²

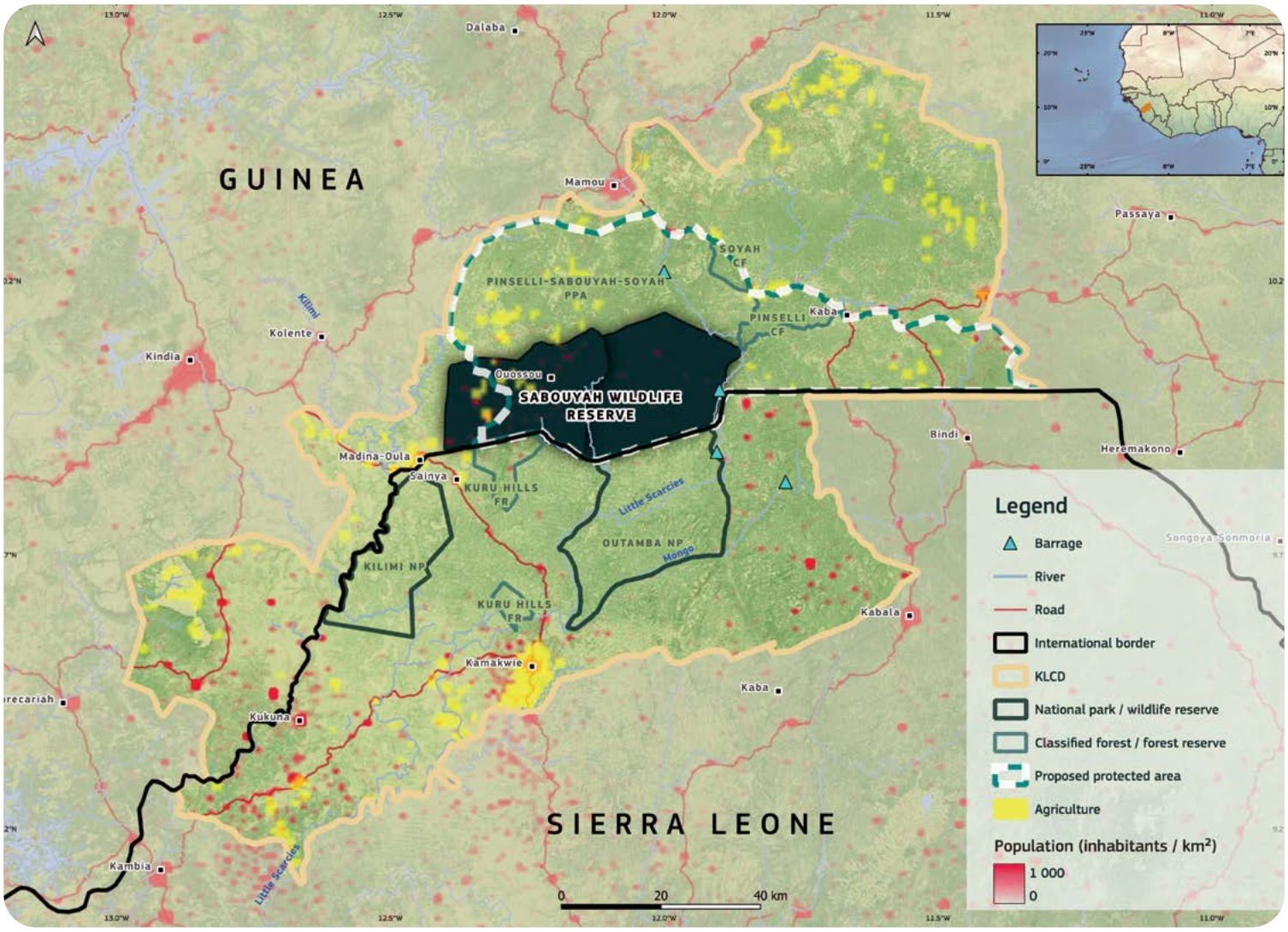
PA manager: *Office Guinéen des Parcs Nationaux et Réserves de Faune* (OGPRF)
Development and management plan not available
Last IMET evaluation: October 2023
IMET index: 50.7

MAIN SPECIES (FAUNA, FLORA): The Sabouyah Wildlife Reserve is host to several wild species including the western chimpanzee (*Pan troglodytes verus*) and other primates, forest elephant (*Loxodonta cyclotis*), giant ground pangolin (*Smutsia gigantea*), white-bellied pangolin (*Phataginus tricuspis*), leopard (*Panthera pardus*), golden cat (*Caracal aurata*), and dwarf crocodile (*Osteolaemus tetraspis*). Three species of vultures are also present: white-backed vulture (*Gyps africanus*), hooded vulture (*Necrosyrtes monachus*), and white-headed vulture (*Trigonoceps occipitalis*).

MAIN THREATS: Illegal timber trafficking is present along the border with Sierra Leone. The forest area is diminishing due to poaching, the expansion of agricultural land through slash-and-burn agriculture, and nomadic grazing. Several villages are located within the Sabouyah zone. The construction of a railway line that crosses the Pinselli-Soyah-Sabouyah zone is a significant threat, with unavoidable negative impacts.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The recognition of the Pinselli-Soyah-Sabouyah area as a national park is underway, a first step to improving the conservation of the area. The creation of an associated management plan will enable the definition of a strategy and objectives, and the steering of conservation actions for these three protected areas. Subsequently, it will be necessary to recruit employees for the national park in order to carry out conservation actions, namely surveillance patrols and fighting against illegal activities, and to provide these teams with infrastructure and equipment in sufficient numbers and quality. The conservation of the territory will have to include partnerships with local populations to develop sustainable management and the valorisation of natural resources (agriculture, cattle breeding, bushfire management, land development, ecotourism, etc.).

Construction of a railway in the heart of the Sabouyah Wildlife Reserve, Guinea. (© M. Languy)

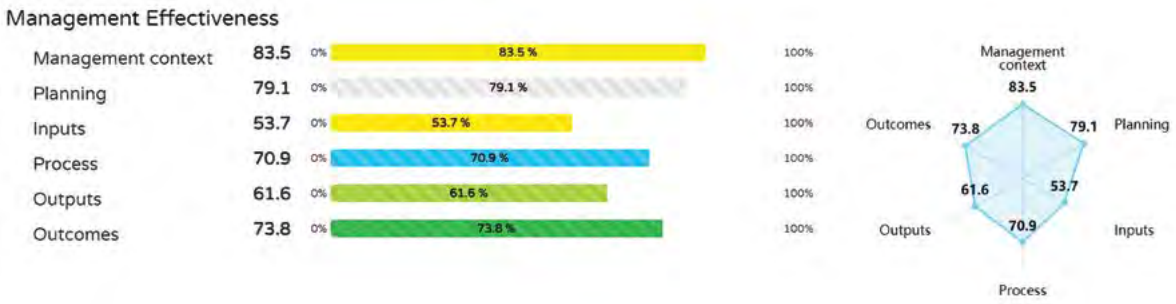


3.2 GOLA - FOYA - LOFA (GOLA)

SIERRA LEONE
GOLA RAINFOREST NATIONAL PARK

Gola Rainforest National Park
Category II, national park
Creation date: 2011
Area: 770 km², distributed across three blocks

PA manager: Gola Rainforest Conservation
Development and management plan revision in progress (2012-2018)
Last IMET evaluation: 2024
IMET index: 70.4



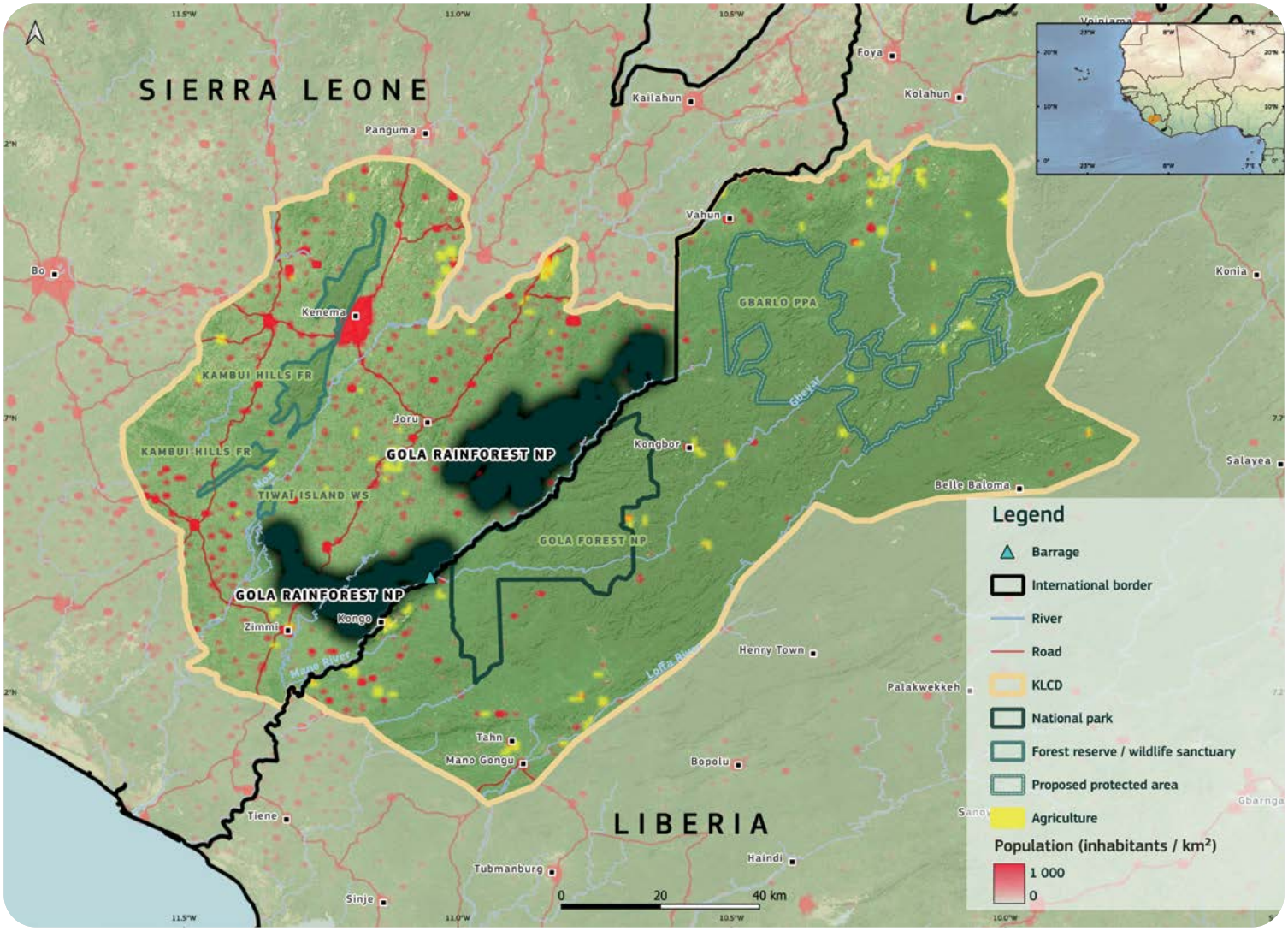
MAIN HABITATS: The Gola Rainforest National Park comprises dense evergreen and semi-deciduous rainforests, as well as swamp forests in its wetlands.

MAIN SPECIES (FAUNA, FLORA): Different emblematic and endangered species are present in the Gola Rainforest: the pygmy hippopotamus (*Choeropsis liberiensis*), western chimpanzee (*Pan troglodytes verus*), Jentink's duiker (*Cephalophus jentinki*) and forest elephant (*Loxodonta cyclotis*). Also present are characteristic species of birds, such as the yellow-headed picathartes (*Picathartes gymnocephalus*), rufous fishing owl (*Scotopelia ussheri*), and Gola malimbe (*Malimbus n'si*), as well as Daniela's toad (*Sclerophrys taiensis*), endemic to the region and critically endangered.

OTHER CONSERVATION VALUES: The Gola Rainforest NP is part of the Greater Gola transboundary landscape shared by Sierra Leone and Liberia, a zone that exhibits a very rich biodiversity and is very important for the conservation of forests in Upper Guinea. Endemism is very strong. The Gola Rainforest is also an IBA: 327 bird species have been identified. For the other taxa, the following species have been identified: 154 mammals, 53 amphibians, 38 reptiles, more than 140 dragonflies and 561 species of butterflies, most of which are forest-dependent. Also, more than 2 800 plant species have been observed in this the largest dense rainforest area still intact in Sierra Leone.

MAIN THREATS: Similarly to what is being observed in other protected areas forming the Greater Gola transboundary landscape, mining operations, logging, hunting and poaching are the most notable threats within the Gola Rainforest NP. Conservation-induced tensions with local communities concern mainly access to natural resources and their exploitation, i.e. certain precious ores, lumber and non-timber forest products (NTFPs), as well as bush meat. There are also human-animal conflicts resulting from damage to crops caused by certain species, as well as the clarification of the park boundaries. Disagreements also occur concerning the sharing of conservation profits with local communities.

*A Western red colobus (*Piliocolobus badius*) in the Gola-Foya landscape, Sierra Leone.(© M. Languy)*



RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: A conservation priority is the restoration of the forest buffer zone, in particular the restoration of the connectivity between Tiwai and the southern block of the national park. It is also important to reinforce the carbon funding mechanism, and to ensure the protection of the park by means of frequent patrols. The inscription process of the Gola Rainforest onto the UNESCO World Heritage List (with the Tiwai Island Wildlife Sanctuary) also needs to be continued.

SIERRA LEONE

KAMBUI HILLS FOREST RESERVE

Kambui Hills Forest Reserve
Category VI, protected area with sustainable use of natural resources
Creation date: 1920
Area: 212 km²

PA Manager: National Protected Area Authority (NPAA)
No development and management plan available (provisional version proposed in 2023)
Latest IMET evaluation: November 2023
Last IMET score: index 42

MAIN HABITATS: The Kambui Hills Forest Reserve is composed of montane forests up to 645 m, and of dense evergreen and semi-deciduous rainforests. Despite the fact that some zones are very steep, these forests are being exploited for their wood and are crisscrossed by ancient roads. The forests, either exploited or secondary, cover almost 80 % of the reserve's surface area.

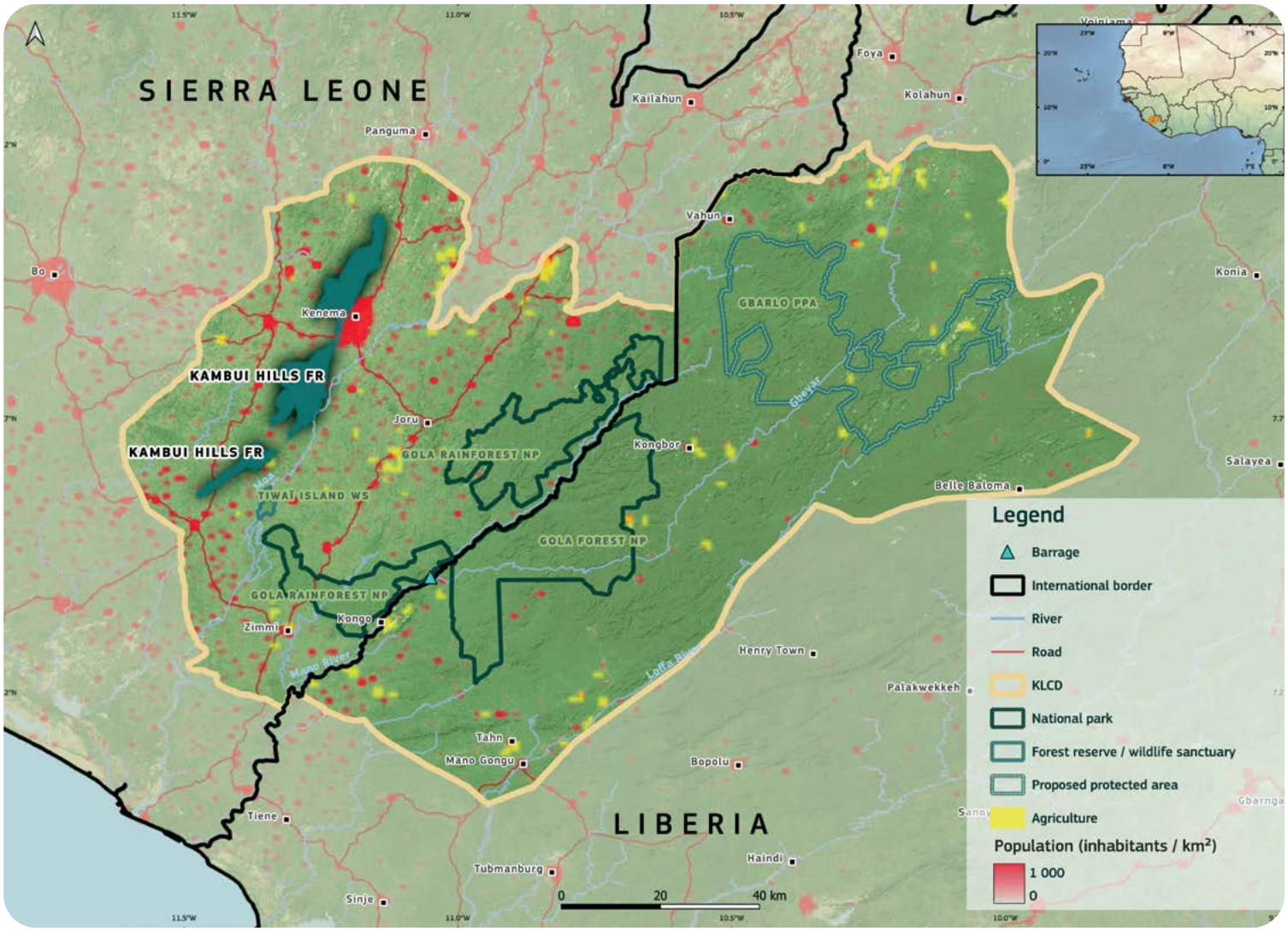
MAIN SPECIES (FAUNA, FLORA): The Kambui Hills Forest Reserve is host to several species: the western chimpanzee (*Pan troglodytes verus*), wild pig (*Potamochoerus porcus*), king colobus (*Colobus polykomos*), sooty mangabey (*Cercocebus atys*) as well as several species of duikers: Maxwell's duiker (*Cephalophus maxwelli*), black duiker (*Cephalophus niger*), yellow-backed duiker (*Cephalophus sylvicultor*), and the bay duiker (*Cephalophus dorsalis*). The yellow-headed picathartes (*Picathartes gymnocephalus*) is also present, alongside more than 200 other species of birds.

OTHER CONSERVATION VALUES: The Kambui Hills Forest Reserve is a nature zone near urban centres, namely the town of Kenema, and as such it has significant ecotourism potential. It covers a catchment area with numerous rivers that supply water to the town of Kenema and nearby villages. The local chimp populations are known to practise nut cracking.

MAIN THREATS: There seems to be intense human activities within the Kambui Hills Forest Reserve, as signs of human presence can frequently be found in the forest. Illegal logging (for the production of charcoal), mining and poaching are the main threats faced here. Slash-and-burn agriculture and construction take place following illegal sales of land.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: One major recommendation is to modify the PA status in order to clarify the legality of activities and improve law enforcement efficacy. This would also clarify and simplify the mandates of the institutions in charge of the management of the protected area. Among the various options, there is the implementation of a type of co-management based on the experience gained in the Tiwai sanctuary and in the Gola Rainforest NP. The first step needed to improve the conservation status of the Kambui Hills Forest Reserve is the implementation of surveillance and responses to illegal human activities such as logging, mining, hunting and farming. In parallel, the pressure exerted on forest resources could be lowered if the dependency of the local communities on subsistence could be improved through the development of income-generating activities and the creation of markets for the supply of food products.

*The wild pig (*Potamochoerus porcus*) is one of the flagship species of the Kambui Hills. (RudiErnst / Shutterstock)*

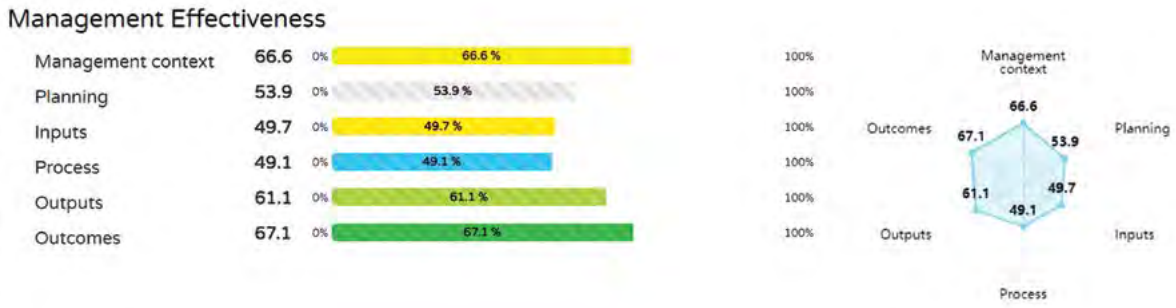


SIERRA LEONE

TIWAI ISLAND WILDLIFE SANCTUARY

Tiwai Island Wildlife Sanctuary
Category IV, habitat or species management area
Creation date: 1987
Area: 12 km²

PA Manager: Tiwai Island Administrative Committee
Management plan 2020-2030
Last IMET evaluation: 2024
IMET index: 57.9



MAIN HABITATS: Vegetation on Tiwai Island is composed of mature forests, secondary forests, and swamps. These are dense evergreen and semi-deciduous rainforests; swamp forests are found in the wetlands and in the catchment basins.

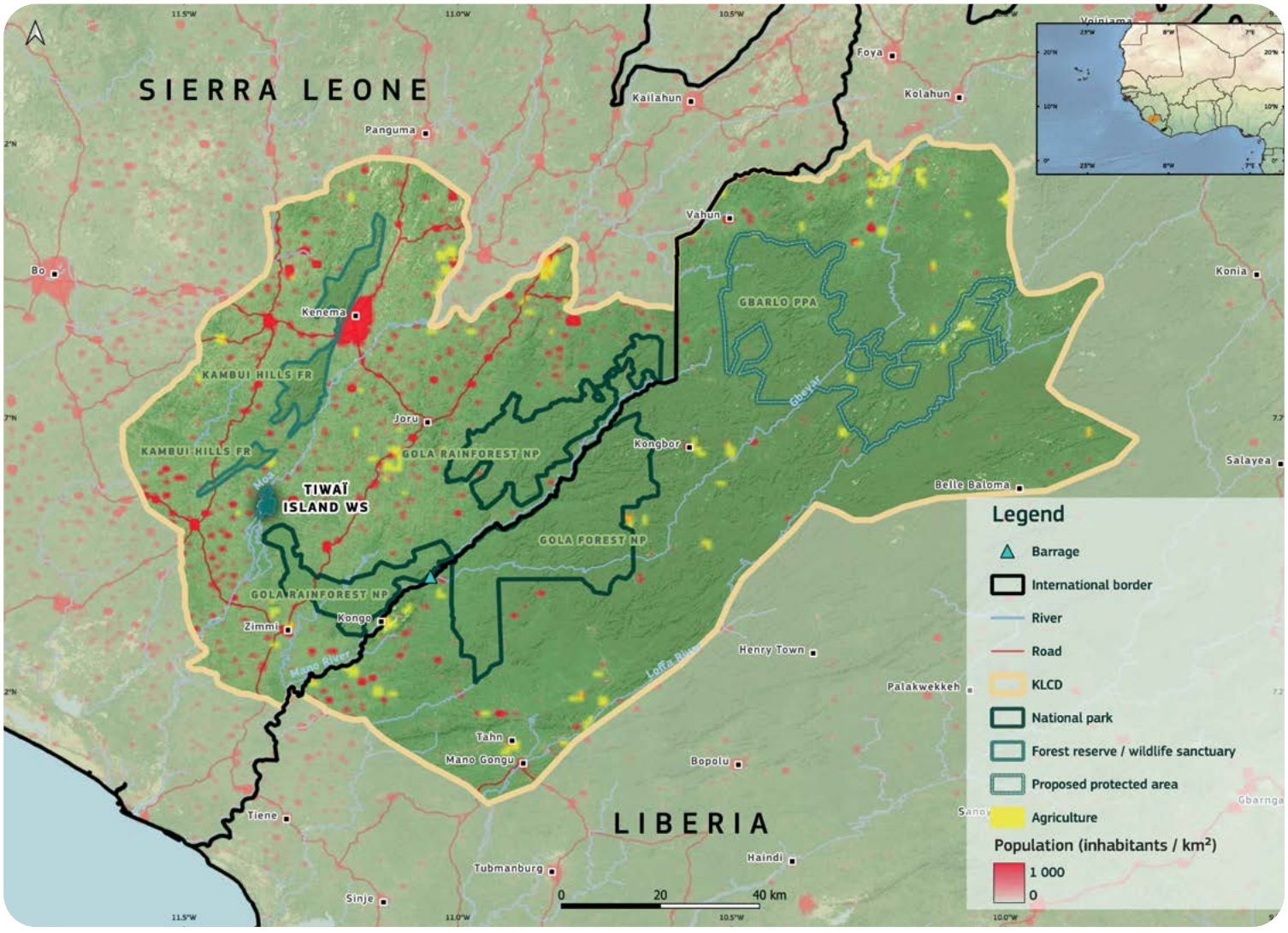
MAIN SPECIES (FAUNA, FLORA): Numerous animal species are present on Tiwai Island. The most emblematic ones are the western chimpanzee (*Pan troglodytes verus*), pygmy hippopotamus (*Choeropsis liberiensis*), bongo (*Tragelaphus eurycerus*) and bushbuck (*Tragelaphus scriptus*). Tiwai Island is known worldwide for its communities of primates, comprising 11 species, including 9 diurnal ones. Among other mammals of interest are a wide variety of duikers (7 species). Tiwai also boasts a high density of rufous fishing owls (*Scotopelia ussheri*) endemic to the forests of Upper Guinea. One dragonfly, the *Zygonyx annika*, is currently only found within the Tiwai sanctuary, and another one, *Pseudagrion pacale*, is only found in Tiwai and in one other site 40 km to the north.

OTHER CONSERVATION VALUES: The Tiwai Island Wildlife Sanctuary is the largest nature reserve on the Moa River. It has a wide diversity of animals including, more specifically, 11 primate species, as well as a diversified bird population in the forest. It is managed by an administrative committee composed of representatives from eight communities, which makes it an example of community conservation. It is also an ecotourism site of high interest.

MAIN THREATS: Tiwai Island faces few threats but it could end up being isolated from the rest of the landscape. Bamboo, which is an invasive, exotic and colonising species, degrades the habitats. The introduction of other invasive plants or of certain ants that are termite predators, constitute other threats. Intense tourism, if poorly managed, could also threaten some habitats and species. Inappropriate tourism management and revenue sharing could trigger problems.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The Tiwai Island Wildlife Sanctuary would benefit from its reconnection to the southern part of the Gola Rainforest NP. It is also important to finalise its inscription in the UNESCO World Heritage List and to improve ecotourism services.

*A rufous fishing owl (*Scotopelia ussheri*)*
on Tiwai Island, Sierra Leone (© M. Languy)

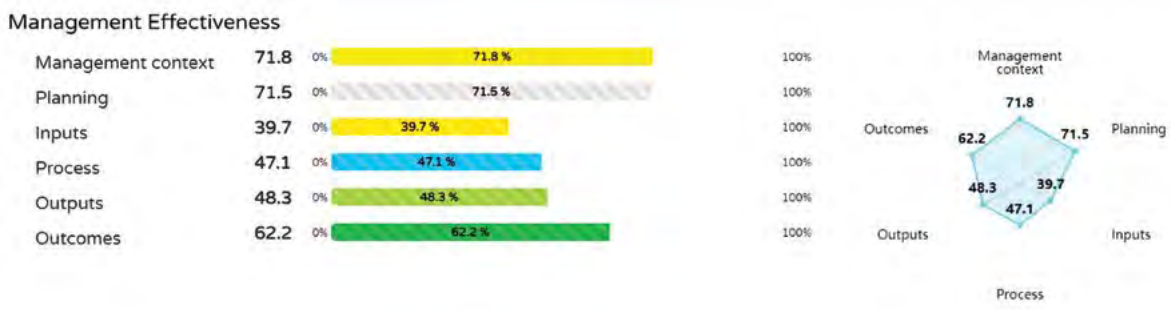


LIBERIA

GOLA FOREST NATIONAL PARK

Gola Forest National Park
Category II, national park
Creation date: 2016
Area: 880 km²

PA Manager: Forestry Development Authority (FDA)
Development and management plan 2019-2024
Last IMET evaluation in November 2023
IMET index: 56.8



MAIN HABITATS: The Gola Forest NP is composed of the forests of Upper Guinea, which include dense evergreen and semi-deciduous rainforests. Swamp forests are also present in the wetlands. It is one of the largest untouched forest zones in the region.

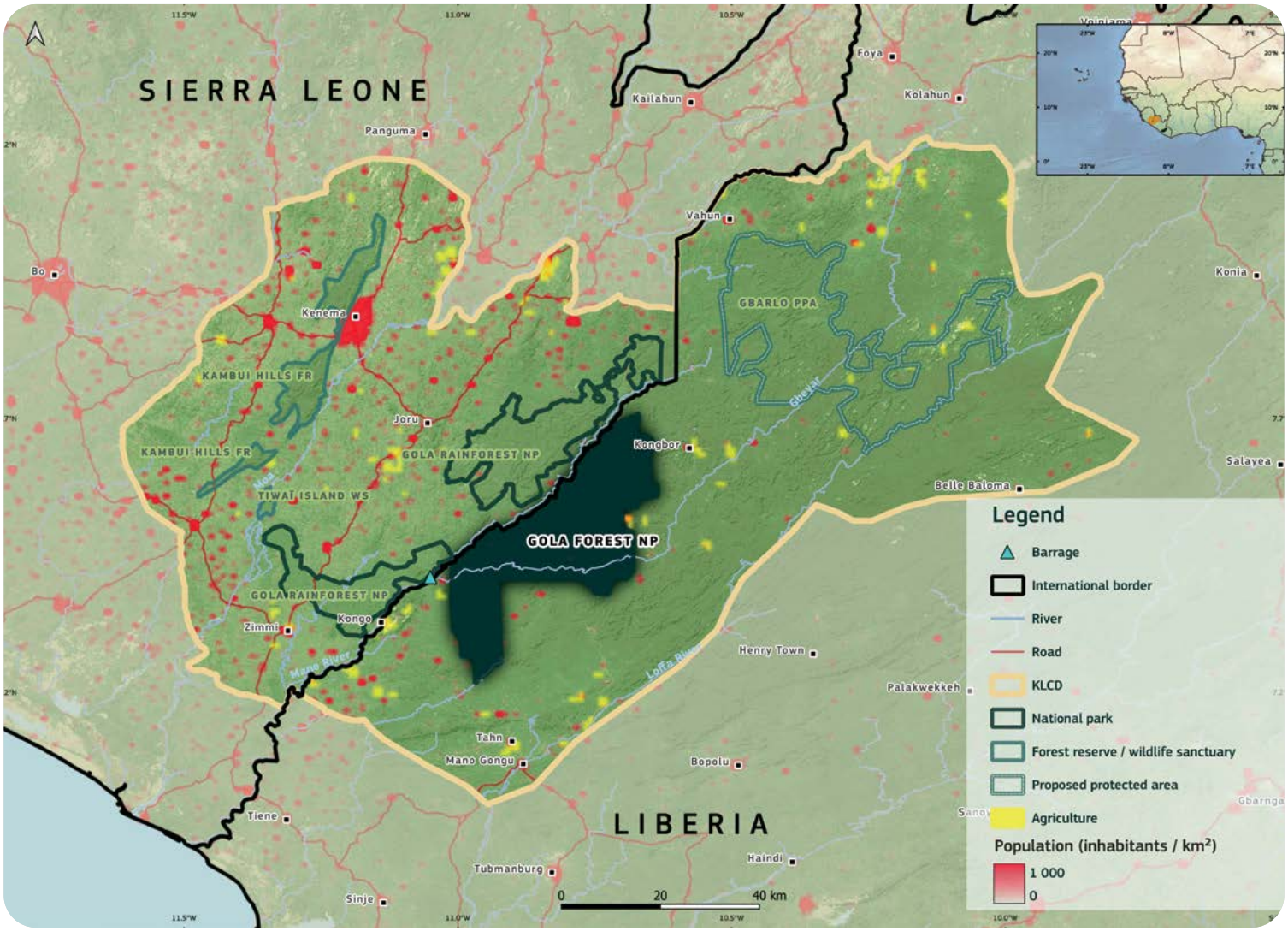
MAIN SPECIES (FAUNA, FLORA): The animal population of the national park comprises several endangered species and species endemic to the Guinean forests: the forest elephant (*Loxodonta cyclotis*), western chimpanzee (*Pan troglodytes verus*), 11 other species of primates, and pygmy hippopotamus (*Choeropsis liberiensis*). The park is also known for its populations of yellow-headed picathartes (*Picathartes gymnocephalus*) and Ballmann's malimbe (*Malimbus ballmanni*). Various studies have been carried out to survey the national park's fauna. This made it possible to identify 14 species of amphibians, 4 species of reptiles, 41 species of bats, including 3 that are endemic to the park, 700 species of butterflies, 90 species of damselflies and dragonflies, 20 species of small mammals and 109 species of large mammals. There are at least 899 vegetal species, including 232 species of trees. The common wood species are the *Cynometra leonensis*, the *Brachystegia leonensis* (Fabaceae), and the niangon (*Heritiera utilis*, Malvaceae).

OTHER CONSERVATION VALUES: The Gola Forest NP is part of the Greater Gola Transboundary Landscape. This landscape is a key biodiversity area (KBA), as well as an IBA, hosting at least 216 bird species. Endemism is very high. The Gola Forest is also the largest African site of the Alliance for Zero Extinction (AZE). This forest area is considered to be a carbon sink, contributing to climate change mitigation.

MAIN THREATS: The threats that the Gola Forest faces are illegal logging and charcoal production, mining, poaching (including cross-border poaching) and village encroachment. In the last two years, mining has increased and caused major deforestation in different parts of the park. Recently, similar activities originating from adjacent zones in Liberia and Sierra Leone have been observed.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Legislation must be revised in order to prohibit or at least minimise mining activities within the national park. Governance and management efficiency must be improved. The number of agents in the park needs to be increased, as well as their law enforcement training, and support must be provided to the local communities for sustainable development, together with awareness raising actions. The implementation of the registration process to include the Gola Forest NP in the UNESCO World Heritage List is an opportunity to form a transboundary site together with the Tiwai Island Wildlife Sanctuary.

*Western white-lipped frog (*Amnirana *sp* albolabris ‘*West’), Gola, Sierra Leone. (© M. Languy)*



*The forest vine snake, also known as the twig snake (*Thelotornis kirtlandii*) is a species of venomous snake in the Colubridae family. (© M. Languy)*

LIBERIA

FOYA PROPOSED PROTECTED AREA – PROPOSED GBARLO NATIONAL PARK

Foya Proposed Protected Area – Proposed Gbarlo National Park
Currently not recognised by the IUCN, but proposed for inclusion in category II, national park.
Classified as a national forest in 1957 and proposed as a protected area in 2006.
Area: 1 049 km²

PA Manager: Forestry Development Authority (FDA)
Development and management plan not available (in progress)
Last IMET evaluation: November 2023

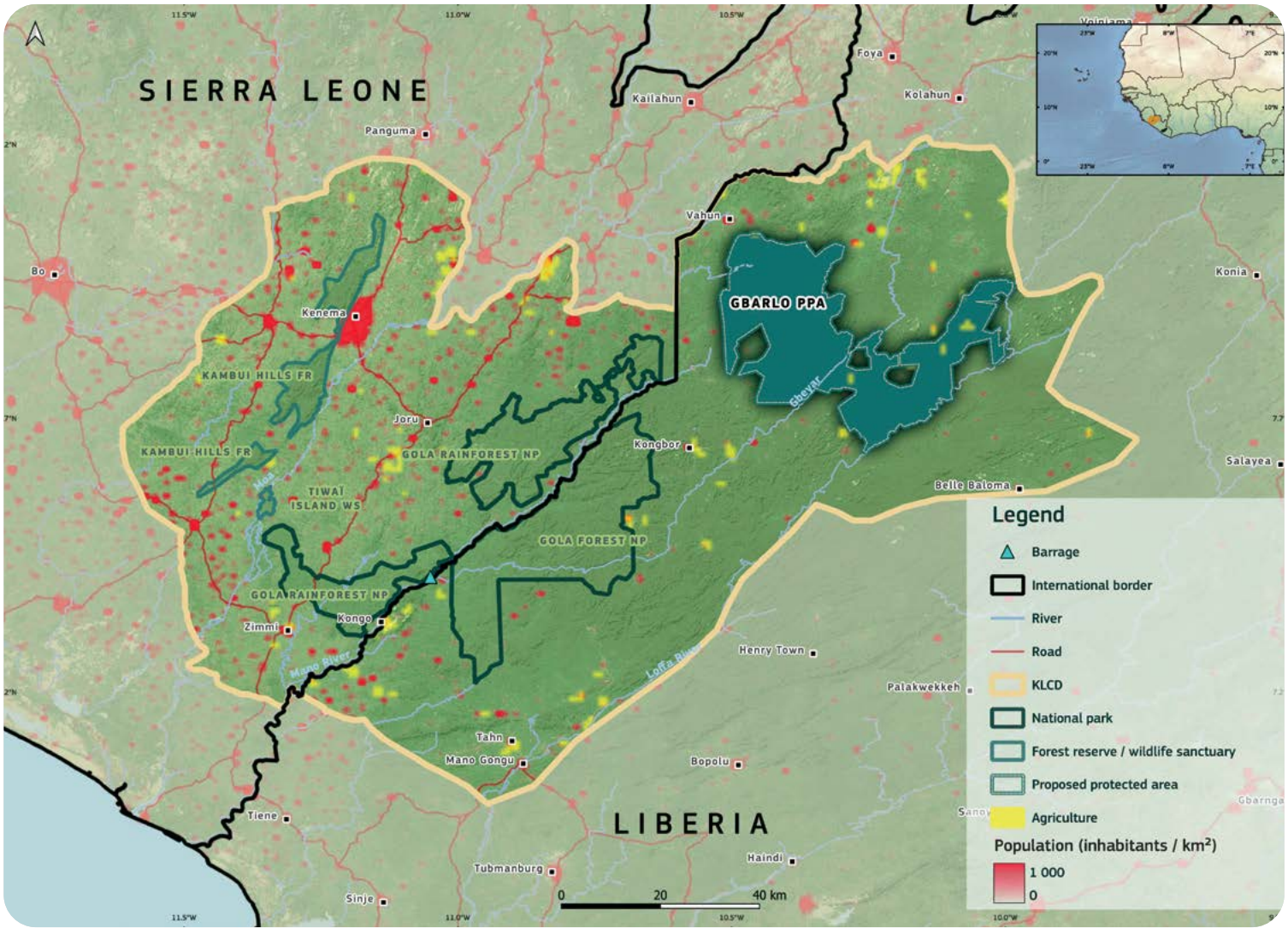
MAIN HABITATS: The Foya proposed protected area (PPA) is mainly composed of dense evergreen and deciduous rainforests. Swamp forests are found in the catchment basins and in the wetlands. The forest canopy is still relatively high and untouched areas of mature forests are also present.

MAIN SPECIES (FAUNA, FLORA): The emblematic animal species of the Foya PPA include the western chimpanzee (*Pan troglodytes verus*) and forest elephant (*Loxodonta cyclotis*), as well as other priority conservation species such as pygmy hippopotamus (*Choeropsis liberiensis*), and several species of other primates, amphibians and reptiles.

OTHER CONSERVATION VALUES: The Foya PPA contributes to the ecological connectivity of the Greater Gola landscape by means of the Tonglay and Normon community forests. These forest areas form a major forest corridor, so with the addition of Foya/Gbarlo, the size and resilience of the western Liberia / eastern Sierra Leone forest block will be reinforced.

MAIN THREATS: The zone is impacted mainly by artisanal mining, the expansion of subsistence agriculture, artisanal logging, poaching and encroachment, including cross-border encroachment. The inscription process of the protected area, especially the definition of its future boundaries, is a complex process further complicated by the isolation of certain communities. The risk of connectivity loss with other protected areas before the protected area is formalised is a major risk.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The national park inscription process must be carried out as per the principles of free, prior and informed consent (FPIC), while guaranteeing, as much as possible, connectivity with the Gola Forest NP. This will also require the implementation of a support programme for the protected area and its local communities. In parallel, the development and management plan must be finalised and implemented, namely by providing the PA with infrastructure and sufficient human and material means.

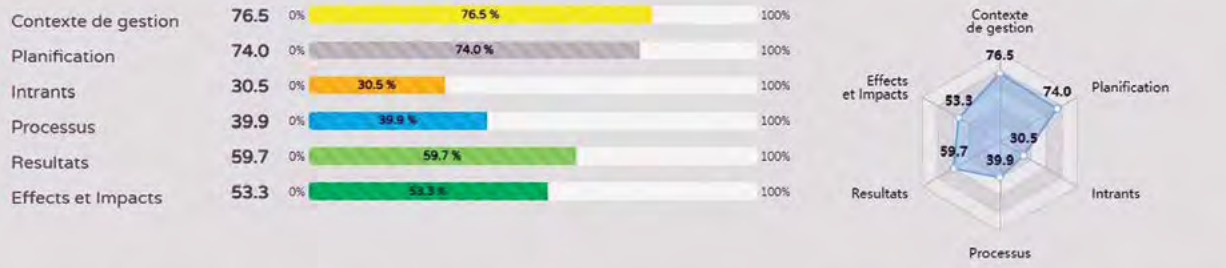

SIERRA LEONE
LIBERIA
Panguma
Kailahun
Foya
Kolahun
Vahun
Kenema
Bo
GBARLO PPA
Konia
KAMBUI HILLS FR
KAMBUI HILLS FR
Joru
GOLA RAINFOREST NP
Kongbor
Salayea
Belle Baloma
TIWAI ISLAND WS
GOLA FOREST NP
GOLA RAINFOREST NP
Kongo
Zimmi
Henry Town
Palakwekkeh
Tahn
Mano Gongu
Bopolu
Tiene
Haindi
Tubmanburg
Sinje
0
20
40 km
Legend
Barrage
International border
River
Road
KLCD
National park
Forest reserve / wildlife sanctuary
Proposed protected area
Agriculture
Population (inhabitants / km²)
1 000
0

3.3 WOLOGIZI - WONEGIZI - ZIAMA (WWZ)

GUINEA
ZIAMA BIOSPHERE RESERVE

Ziama Biosphere Reserve
Currently not recognised by the IUCN but recognised as a biosphere reserve
Creation date: 1943
Area: 1 221 km²

PA Manager: *Centre Forestier de Nzérékoré*
Management plan available (2020-2029)
Last IMET evaluation: 2024
IMET index: 55.65

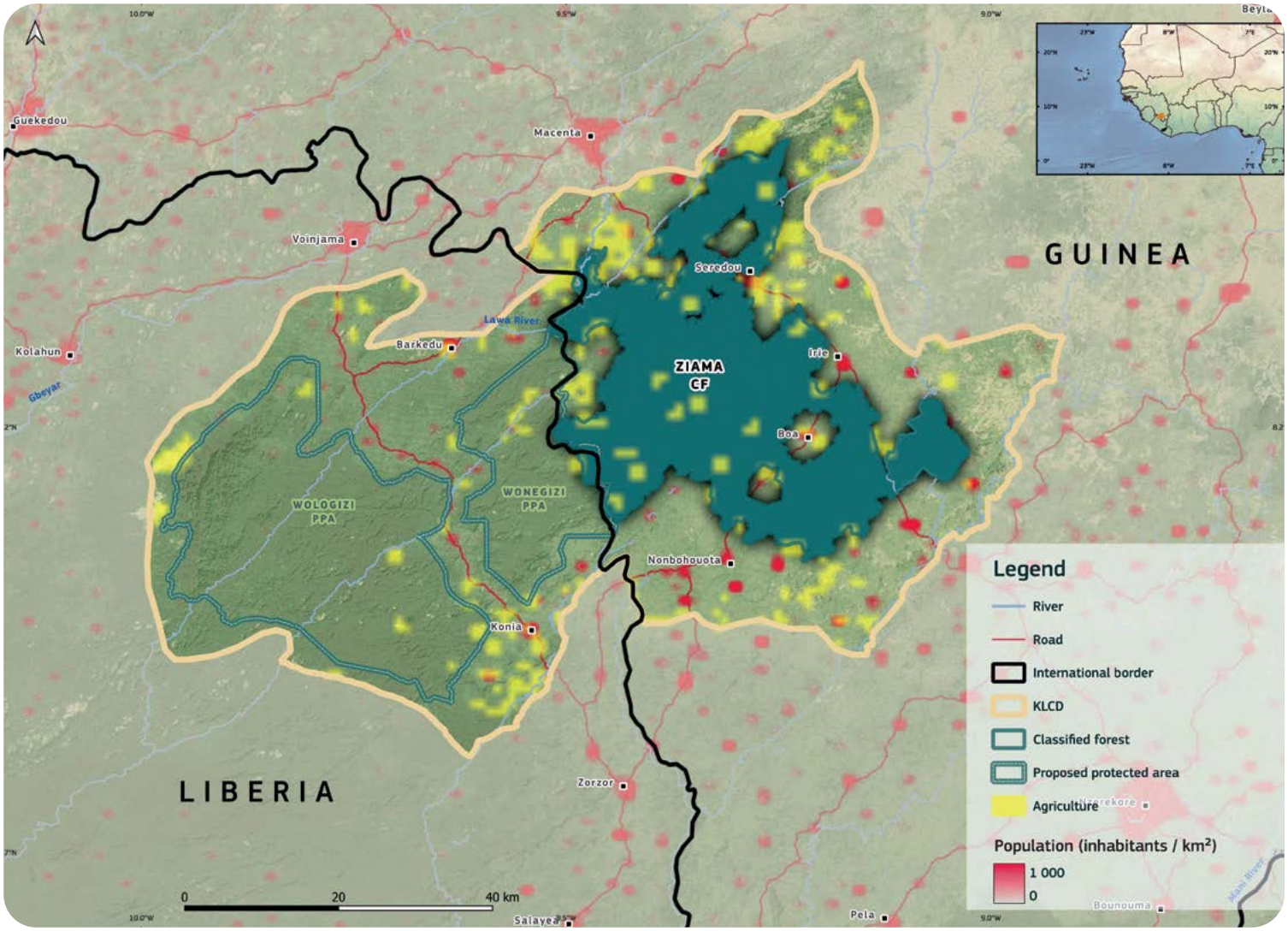


Contexte de gestion	Planification	Intrants	Processus	Resultats	Effects et Impacts	IMET index
76.5	74	30.5	39.9	59.72	53.3	55.65

MAIN HABITATS: Different forest formations are present in the Ziama Biosphere Reserve: dense rainforests occur in high (above 1 000 m), medium (between 950 and 1 000 m) and low altitudes, gallery forests and swamp forests. The forest is evergreen or semi-deciduous. Zones of shrubby savannahs, monospecific forest plantations and plots managed under agroforestry are also present.

MAIN SPECIES (FAUNA, FLORA): The wood species characteristic of the Ziama Biosphere Reserve are niangon (*Heritiera utilis*, Malvaceae), dibetou (*Lovoa trichilioides*, Meliaceae), several species of the genus *Entandrophragma* and *Khaya* (Meliaceae), dabema (*Piptadeniastrum africanum*, Fabaceae), iroko (*Milicia excelsa*, Moraceae) and makore (*Tieghemella heckelii*, Sapotaceae, under threat of extinction). Several emblematic animal species are found in the Ziama Biosphere Reserve: forest elephant (*Loxodonta cyclotis*), western chimpanzee (*Pan troglodytes verus*), pygmy hippopotamus (*Choeropsis liberiensis*), and giant ground pangolin (*Smutsia gigantea*), all of which are endangered. In addition to these species, several reptiles and birds of the Ziama forest are threatened or vulnerable: the Mount Aureol squeaker frog (*Arthroleptis langeri*), ringed puddle frog (*Phrynobatrachus annulatus*), western gecko (*Cnemaspis occidentalis*), Ziama toothed frog (*Odontobatrachus ziama*), white-breasted guineafowl (*Agelastes meleagrides*), yellow-casqued wattled hornbill (*Ceratogymna elata*), yellow-bearded greenbul (*Criniger olivaceus*), and green-tailed bristlebill (*Bleda eximius*).

OTHER CONSERVATION VALUES: The Ziama Biosphere Reserve is the largest listed forest in Guinea and the largest tropical massif in the country. It is recognised as a Man and the Biosphere (MAB) reserve and as an IBA. It is one of the



pilot sites for the implementation of the 2020-2030 national plan for the conservation of the chimpanzees of Guinea, and has been recognised as a very important priority zone for the preservation of biodiversity in the region.

MAIN THREATS: The Ziama Biosphere Reserve is impacted by human activities. The main threats are forest clearing for subsistence farming (slash-and-burn agriculture), increased human-fauna conflicts, poaching and overexploitation of wood and NTFPs, such as cane and certain medicinal plants. Significant mining activities also take place there. The Ziama forest is for the time being fairly well preserved, despite its configuration, i.e. numerous forest blocks separated by tree-cleared zones.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Different activities are implemented at the periphery of the Ziama forest to minimise the risk of damage caused to crops by elephant, e.g. the development of crops unfit for animals, and those with local trade potential (rubber trees and oil palm), elephant-deterring methods, training in sustainable agricultural methods to support the transition to sedentary farming. Within the forest reserve, human-wildlife conflict is prevented by means of speed control panels at the level of animal corridors. Recommendations to improve the management of the Ziama Biosphere Reserve include the empowerment and involvement of local communities in the conservation process, the development of revenue-generating activities, and the training of eco-guards in the management and conservation of biodiversity. Also important are the development of environmental education programmes and the application of law enforcement.

At the scale of the Wologizi-Wonegizi-Ziama (WWZ) landscape, one priority is to improve ecological connectivity through the recognition of ecological corridors by local communities. This community-based forest management approach is carried out together with the implementation of environmentally friendly agricultural and industrial practices. One prerequisite for success at the scale of the landscape is the implementation of sound community governance, at the level of the protected areas and of the OECMs.

LIBERIA

WOLOGIZI PROPOSED PROTECTED AREA

Wologizi Proposed Protected Area
Not currently recognised by the IUCN, but a PPA
Creation date: 1954
Area: 995 km²

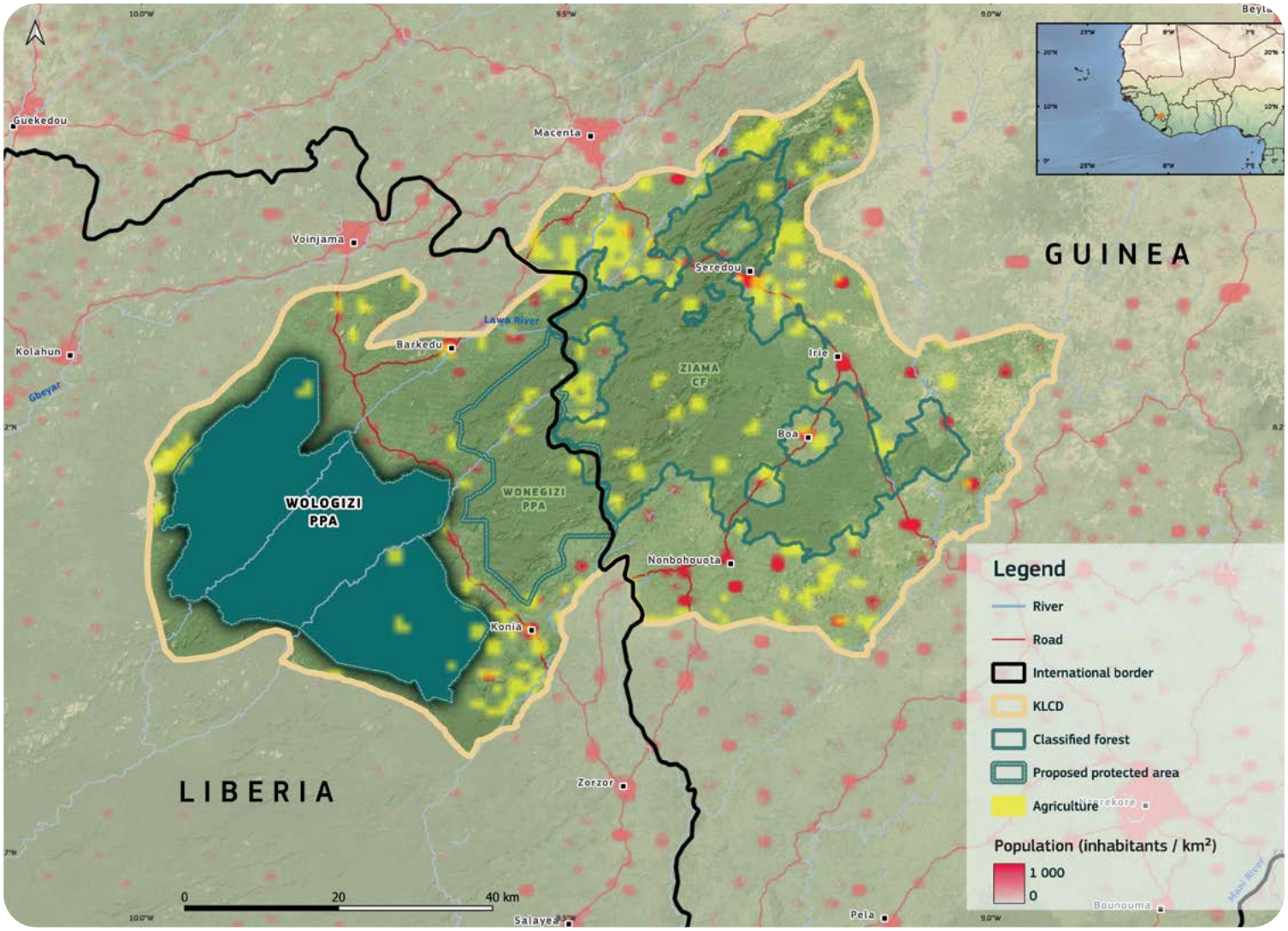
PA Manager: Forestry Development Authority (FDA)
Development and management plan not available
No IMET evaluation available

MAIN HABITATS: The Wologizi forest is composed of dense rainforests located at high, medium and low altitudes. The high and medium-altitude forests are well preserved; gallery forests are found along the main waterways. Savannah and secondary forest zones are also present. Mount Wutuve is Liberia's tallest mountain (between 1 350 and 1 447 m) and is composed of two steep mountain ranges separated by a valley: the lower south ridge has an altitude of 1 050 m; the north ridge is longer and higher and comprises Mount Mutuwe and Mount Belegizi (1 186 m). The mature forest is mountainous above 800 m, dense rainforest below. Isolated spots of herbaceous savannahs can be found in the plains.

MAIN SPECIES (FAUNA, FLORA): A diversity of plant species of interest is present in the Wologizi forest: iroko (*Milicia excelsa*, Moraceae), ekki (*Lophira alata*) and dibetou (*Lovoa trichilioides*), all three of which are exploited for their timber. There is also *Neolemonniera clitandrifolia* (Sapotaceae), recently classified as vulnerable by the IUCN. Several species of genus *Entandrophragma* spp. and *Khaya* spp., also sought for their timber, are abundant in the zone. The animal species present in the Wologizi forest include western chimpanzee (*Pan troglodytes verus*), pygmy hippopotamus (*Choeropsis liberiensis*), Nimba otter shrew (*Micropotamogale lamottei*, endemic to Mount Nimba and observed in Wologizi), dwarf crocodile (*Osteolaemus tetraspis*), and Home's hinge-back tortoise (*Kinixys homeana*). The avian community includes several endangered or vulnerable species: white-backed vulture (*Gyps africanus*), Timneh parrot (*Psittacus timneh*), white-breasted guineafowl (*Agelastes meleagrides*), rufous fishing owl (*Scotopelia ussheri*), yellow-casqued wattled hornbill (*Ceratogymna elata*) and yellow-bearded bristlebill (*Criniger olivaceus*).

OTHER CONSERVATION VALUES: The Wologizi mountain area is considered an important biodiversity area within the forests of Upper Guinea and an IBA. There is also a large diversity of endemic butterflies. Owing to its highland zones, Wologizi is part of a series of para-montane sites where different species of plants and insects (especially butterflies) of restricted distribution are present.

MAIN THREATS: Human activities threaten the proposed Wologizi protected area, mainly intense game hunting for the trade and consumption of bush meat and other animal products (ivory, scales, living animals) and subsistence farming, all of which are expanding significantly. The conversion of forests into agricultural plots, which causes deforestation, also aggravates conflicts between humans and animals. More specifically, elephants frequently damage crops when they forage for food, sometimes leading to reprisals in the form of animal slaughter. Mining and logging also exert high pressure on the zone.



RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The main recommendation here is to finalise the formalisation of the customary land area, as this will contribute to setting the options for the official status of the protected area, which will in turn facilitate conservation measures. Another key point is to collaborate with and raise the awareness of local communities. Initiating the development of sustainable hunting practices by making the population aware of protected species and ending the hunting of endangered species, young animals and pregnant females is also necessary. Spatial and seasonal hunting restrictions can also be enforced to reduce the pressure on animal communities.

LIBERIA

WONEGIZI PROPOSED PROTECTED AREA

Wonegizi Proposed Protected Area
Currently not recognised by the IUCN but proposed for classification as a multiple sustainable use reserve
Area: 276 km²

PA Manager: Forestry Development Authority (FDA)
Development and management plan not available
Last IMET evaluation: August 2023
Last IMET score: index 54.32

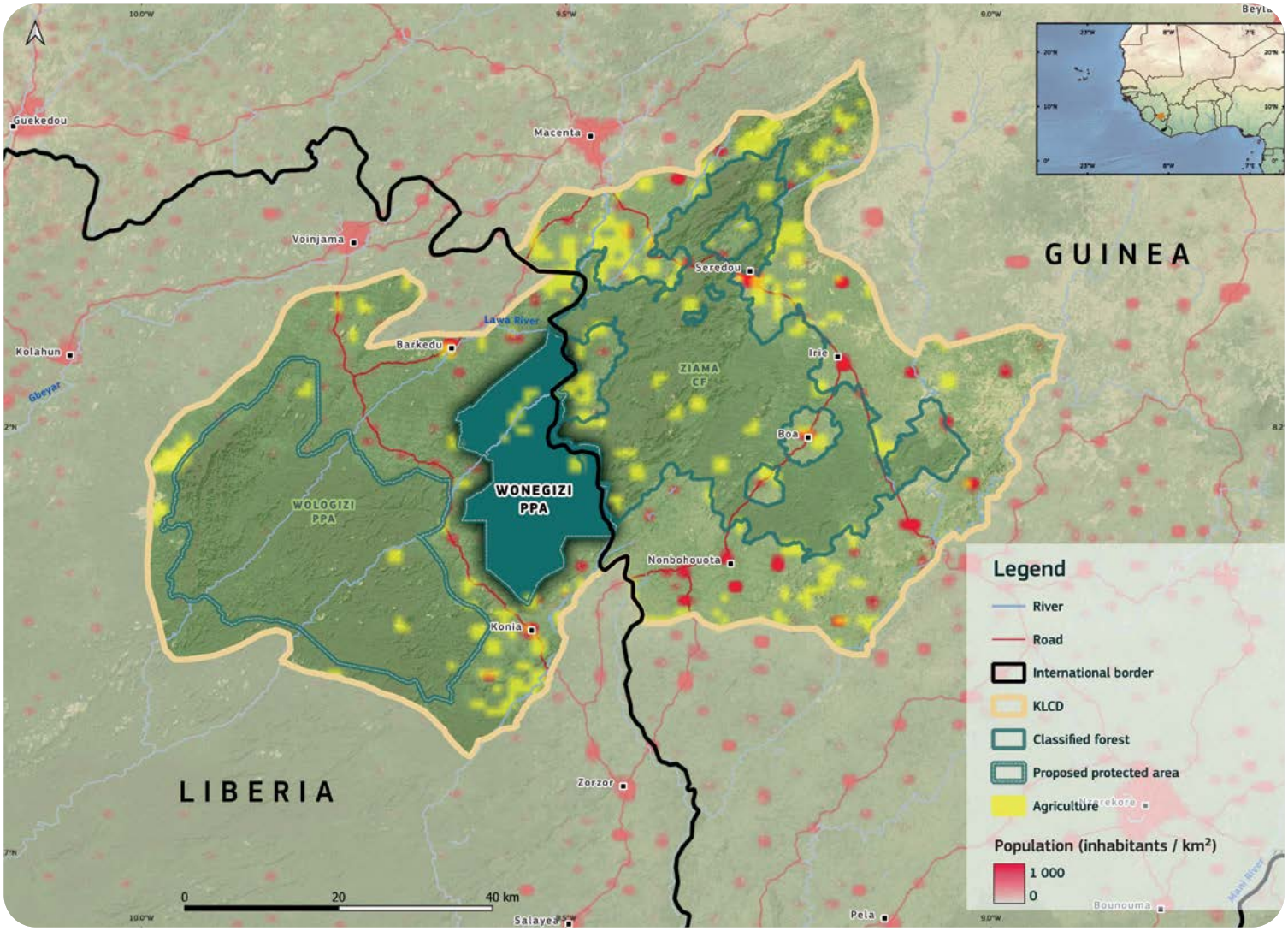
Management context	Planning	Inputs	Process	Outputs	Outcomes	IMET index
68.1	49	46.2	37.9	62.04	62.7	54.32

MAIN HABITATS: Mount Wonegizi (1 110 m) is surrounded by a mosaic of secondary and mature forests. Montane forest is present in the highlands.

MAIN SPECIES (FAUNA, FLORA): The Wonegizi PPA is host to populations of western chimpanzee (*Pan troglodytes verus*), forest elephant (*Loxodonta cyclotis*), pygmy hippopotamus (*Choeropsis liberiensis*), leopard (*Panthera pardus*), African forest buffalo (*Syncerus caffer nanus*), bongo (*Tragelaphus eurycerus*), bushbuck (*Tragelaphus scriptus*), giant forest hog (*Hylochoerus meinertzhageni*) and several species of duikers (*Cephalophus jentinki, Cephalophus dorsalis, Cephalophus silvicultor, Cephalophus niger, Cephalophus brookei, Philantomba maxwellii*).

OTHER CONSERVATION VALUES: The Wonegizi forest is a large carbon sink threatened by forest degradation and deforestation. It provides various timber and NTFPs to the local human populations established in its vicinity. Its community of lepidoptera is highly varied and comprises several species endemic to the West African sub-montane forest zones.

MAIN THREATS: The main threat in the Wonegizi forest comes from the intensity and expansion of subsistence farming. This is practised using slash-and-burn methods and thus contributes to deforestation, to which must be added poaching and logging, including cross-border logging. To a lesser extent, the expansion of commercial farming must be noted, namely the threat associated with oil palm plantations. However, there is limited economic alternative to agriculture for the local populations. Also of importance are human-animal conflicts and the



development of zoonotic diseases (such as Ebola or COVID-19), exacerbated by or in cyclic correlation with the success of wildlife conservation actions. Industrial mining is present, with several mining concessions characterised by unclear limits. The commercial exploitation of the forest is currently less active, but forestry operators would like this to restart.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The process for the inscription of the forest into a *multiple sustainable use reserve* had made good progress, namely with a national validation workshop held in October 2020. This process should be resumed urgently and certain steps should also be implemented rapidly, such as the identification and mapping of adjacent customary lands through formalisation, in order for the Liberian Parliament to pass the classification act. It is important to develop a collaborative, transboundary management strategy for the WWZ landscape to improve the conservation effectiveness of the protected areas. Within this framework, the restoration and preservation of the connectivity between these three sites, the improvement of governance, and the development of subsistence means for the local populations are aspects that can then be taken into account.

3.4 MOUNT NIMBA (NIMBA)

GUINEA

MOUNT NIMBA NATURE RESERVE

Réserve naturelle des monts Nimba
Category Ia, strict nature reserve
Creation date: 1944
Area: 130 km²

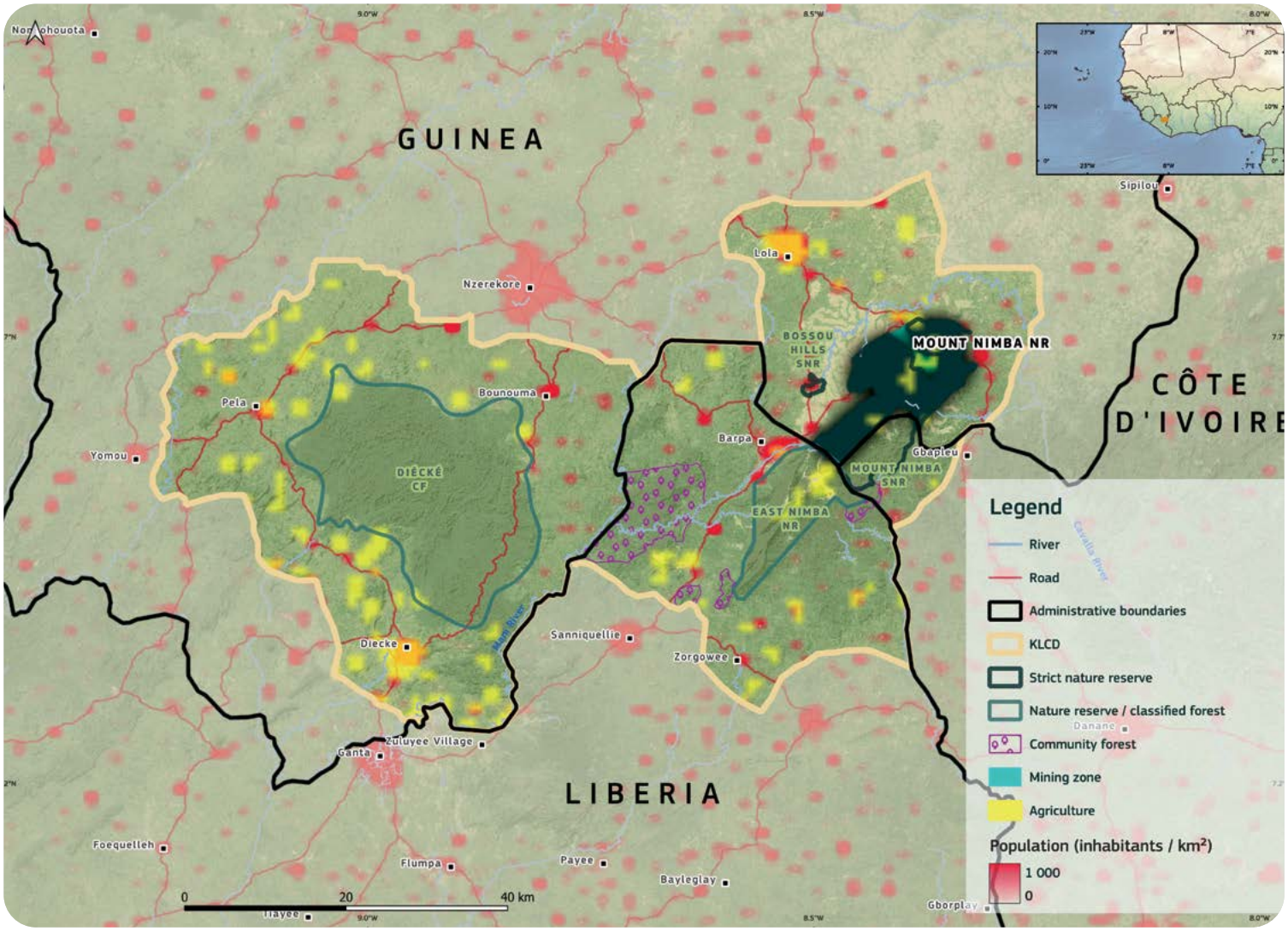
PA Manager: *Centre de Gestion de l'Environnement des Monts Nimba et Simandou* (CEGENS)
Development and management plan 2025-2034 validated in October 2024
Last IMET evaluation: May 2023
Last IMET score: index 49.6

MAIN HABITATS: Mount Nimba has a maximum altitude of 1 752 m. It forms the border between Liberia, Côte d'Ivoire and Guinea. The Mount Nimba Strict Nature Reserve in Guinea is characterised by endemic plant species found in prairies and lowland montane forests. It is composed of evergreen, often secondary, forests, which are relatively well preserved due to the steep slopes that characterise the zone. Savannahs and prairies are present in the lower plateaus. The altitude gradient leads to a variety of habitats and species.

MAIN SPECIES (FAUNA, FLORA): The animal community of Mount Nimba exhibits one of the highest endemic levels in West Africa. It includes the Nimba toad (*Nimbaphrynoides occidentalis*), Nimba otter shrew (*Micropotamogale lamottei*), Lamotte's round-leaved bat (*Hipposideros lamottei*), another bat species discovered in 2021 (*Myotis nimbaensis*), all three being critically endangered, and the Sierra Leone prinia (*Schistolais leontica*). Various species of Guinean forest mammals are present, such as western chimpanzee (*Pan troglodytes verus*), king colobus (*Colobus polykomos*), golden cat (*Caracal aurata*), leopard (*Panthera pardus*) and several species of duiker, including Jentink's duiker (*Cephalophus jentinki*). As for plant biodiversity, this reserve includes at least 58 endangered species and is considered an important tropical zone for plants. Around 10 plants endemic to Mount Nimba are found here.

OTHER CONSERVATION VALUES: Mount Nimba is especially important for the water cycle as the zone includes the sources of more than 50 rivers. The Mount Nimba Strict Nature Reserve has been recognised internationally several times for its biodiversity conservation value: it is a site of AZE, an IBA, a MAB reserve, and a UNESCO World Heritage Site (WHS), alongside the reserve on the Ivorian side. The Mount Nimba Integral Nature Reserve has also been identified as a pilot site for the implementation of the 2020-2030 national plan for the conservation of the chimpanzees of Guinea and as a priority zone for the conservation of the biodiversity in Guinea.

MAIN THREATS: Mining is one of the main threats that affect the Mount Nimba region. Part of the biosphere reserve (UNESCO WHS) was delisted in 1992 to create a 'mining



zone', thus enabling open-pit mining of a high-quality iron deposit on certain peaks. Besides the excavation of millions of cubic metres of soil and the irreversible deforestation caused to these areas, the mining activities necessitated the development of large processing and transport infrastructures. Farming plantations and pastoral practices are real, albeit secondary, threats. The forest cover is fairly intact, but the animal communities have been strongly impacted by poaching.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The southern boundaries of the reserve must be finalised urgently, following the modifications made when the zone was delisted after its conversion into a mining area. A support programme will be necessary to displace illegal agricultural zones currently located within the reserve along its boundaries. The Gbakoré conservators' base camp, which has just been rehabilitated by the EU's PAPFor programme, must be occupied by CEGENS agents and possibly reinforced.

It is important to improve the surveillance of the protected areas included in the Mount Nimba biosphere reserve in order to reduce the illegal activities that affect its integrity. This reinforcement should also include the technical capacities of the management authorities. These must have sufficient human, material and financial means to fulfil their obligations. A detailed plan must be designed and implemented jointly with Côte d'Ivoire to remove the two reserves from the list of endangered WHSs.

The genetic diversity and survival of the Bossou chimpanzees are under serious threat. (© M. Languy)

GUINEA

BOSSOU HILLS STRICT NATURE RESERVE

Réserve naturelle stricte des collines de Bossou
Area: 3.2 km² (part of the Mount Nimba Integral Nature Reserve)

Development and management plan 2025-2034 validated in October 2024
Last IMET assessment in 2024

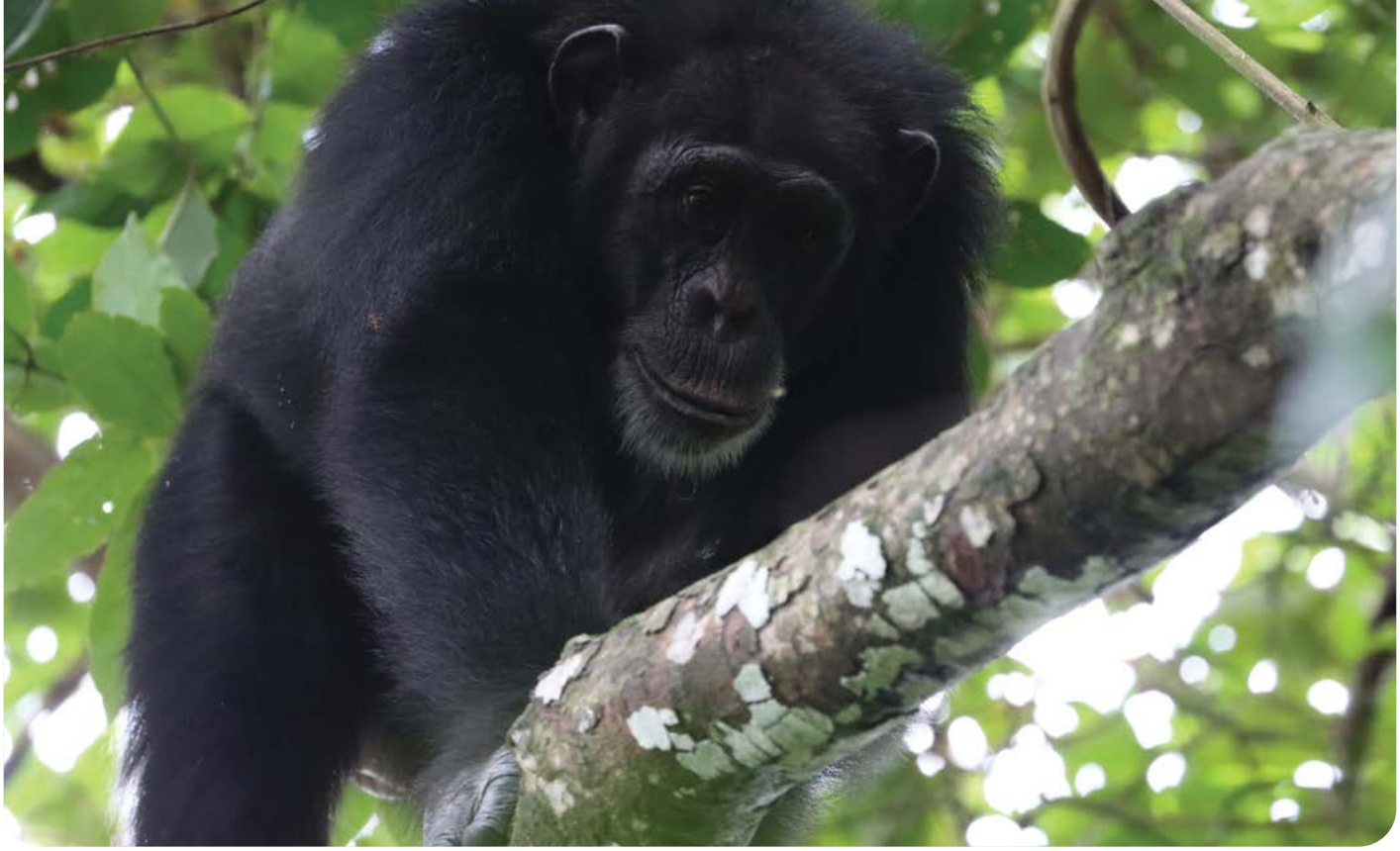
MAIN HABITATS: The village of Bossou rises to an altitude of 550 m in an area of low hills between 70 and 150 m above sea level. The vegetation consists of mature and secondary forests. Around the village are savannahs and gallery forests along watercourses.

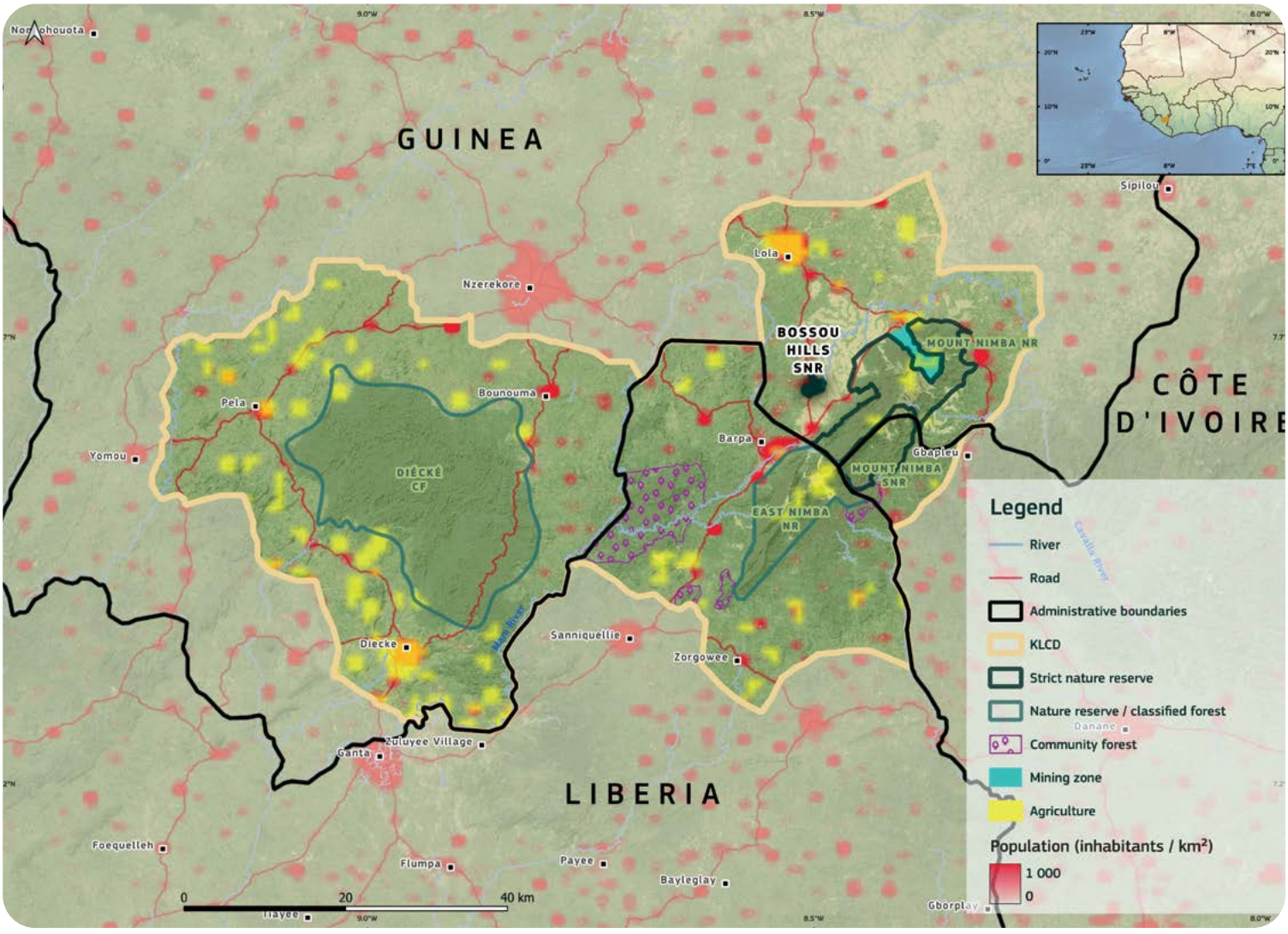
MAIN SPECIES (FAUNA, FLORA): The Bossou hills are home to a population of West African chimpanzees (*Pan troglodytes verus*). It was in Bossou that the behaviour of chimpanzees breaking palm nuts was first observed. The small forest blocks contain a range of birds representative of Guinean forests.

OTHER CONSERVATION VALUES: The Bossou Hills Strict Nature Reserve is included in the Mount Nimba Biosphere Reserve, along with the Mount Nimba Nature Reserve in Guinea and the Mount Nimba Strict Nature Reserve in Côte d'Ivoire.

MAIN THREATS: The Bossou forest is suffering from the illegal encroachment of subsistence farming and bushfires. The chimpanzee population no longer has enough food resources to sustain it throughout the year. As a consequence, chimpanzees feed on crops, leading to increasingly frequent human-wildlife conflicts. The chimpanzee population in the area has been declining since 1976 and is showing a marked ageing trend. It has also been isolated from other populations for several decades, threatening its survival.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: In order to combat the decline in genetic diversity within the Bossou hills chimpanzee population, a project aims to restore a forest corridor between this reserve and the forests of Mount Nimba, but the rate of reforestation is far too slow and support is urgently needed to speed up forest restoration of the corridor. Reforestation activities are also taking place, and should be promoted, within the Bossou Hills strict nature reserve itself.




GUINEA
LIBERIA
CÔTE D'IVOIRE
Nzerekore
Lola
Sipilou
Bounouma
Pela
Yomou
Barpa
Gbapleu
Diecke
Sanniquellie
Zorgowee
Ganta
Zuluyee Village
Foequelleh
Flumpa
Payee
Bayleglay
Gborplay
BOSSOU HILLS SNR
MOUNT NIMBA NR
MOUNT NIMBA SNR
EAST NIMBA NR
DIÉCKÉ CF
Legend
River
Road
Administrative boundaries
KLCD
Strict nature reserve
Nature reserve / classified forest
Community forest
Mining zone
Agriculture
Population (inhabitants / km²)
1 000
0
0
20
40 km

LIBERIA

EAST NIMBA NATURE RESERVE

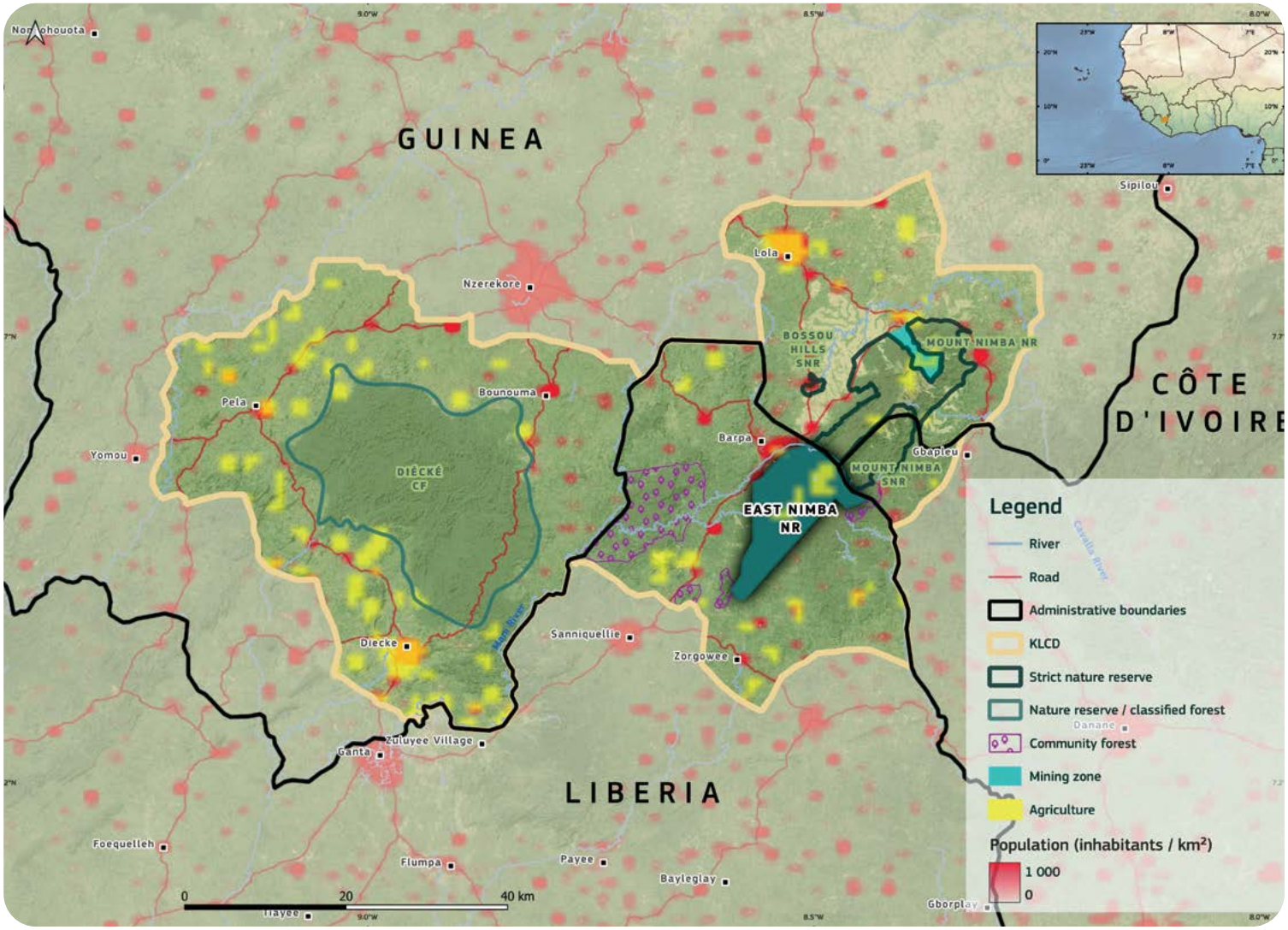
East Nimba Nature Reserve
Category IV, habitat or species management area
Creation date: 2003
Area: 135 km²

PA Manager: Forestry Development Authority (FDA)
Development and management plan 2025-2034 validated in September 2024
Last IMET evaluation: May 2023
IMET index: 46

MAIN HABITATS: As is the case for the other Mount Nimba PAs, the East Nimba Nature Reserve stretches over a significant altitude range – from 450 m to almost 1 350 m – hence its wide diversity of habitats: lowland mature forest with mainly African whitewood (*Triplochiton scleroxylon*, Malvaceae), *Milicia regia* (Moraceae) and African mulberry (*Morus mesozygia*, Moraceae); medium altitude forest rich in ayou, dabema (*Piptadeniastrum africanum*, Fabaceae), and African locust bean (*Parkia bicolor*, Fabaceae); montane cloud forest at 1 000 m, composed of populations of pure Cyathea cylindrical ferns; and, at higher altitudes, montane forest with Guinea plum (*Parinari excelsa*, Chrysobalanaceae) and *Garcinia polyantha* (Guttifereae). Riparian forest zones are found along the waterways, as well as swamps. Zones with dense and bushy scrublands are found in areas degraded by human activities.

MAIN SPECIES (FAUNA, FLORA): There is a very high endemic rate in the East Nimba Nature Reserve, including species such as the Nimba toad (*Nimbaphrynoides occidentalis*), Lamotte's round-leaved bat (*Hipposideros lamottei*), Nimba otter shrew (*Micropotamogale lamottei*), Nimba flycatcher (*Melaenornis annamarulae*), and the Sierra Leone prinia (*Schistolais leontica*). The animal species emblematic of the Guinean forests are the western chimpanzee (*Pan troglodytes verus*) and other primates. Yellow-headed picathartes (*Picathartes gymnocephalus*), golden cat (*Caracal aurata*), and white-bellied pangolin (*Phataginus tricuspis*) are also present.

OTHER CONSERVATION VALUES: The East Nimba Nature Reserve has been internationally recognised several times, bearing witness to its conservation value: an AZE site, an IBA and a KBA.



MAIN THREATS: In the lowlands, the conversion of forests into agricultural zones plays a significant role. In parallel, poaching impacts animal communities, whereas uncontrolled bushfires prevent the natural reforestation of zones deforested during mining activities in the 1980s. These fires also threaten the habitat of the Nimba toad. Mining activities were a threat in the past and led to the transformation of forests into prairies and to the pollution of the Yah River, but today their impact is limited. A tourist lodge is operational in the reserve since June 2024; the impact of tourism on the protected area will need to be minimised.

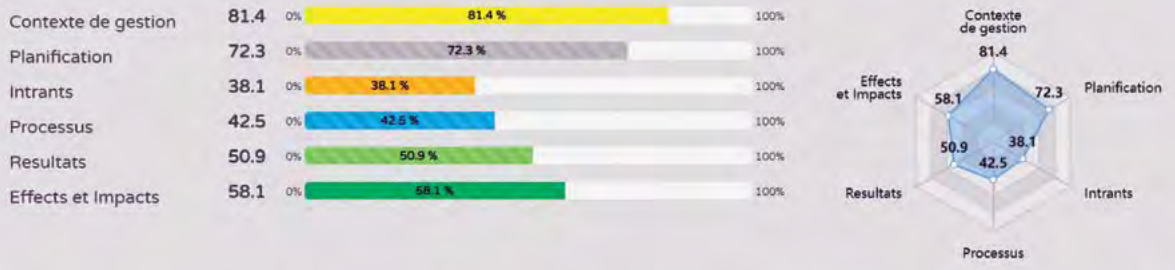
RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The capacities of the management team need to be improved: number of agents, competence and motivation, budget and infrastructure. Since the opportunities for economic activities are limited for local populations, it is important to create compatible income-generating activities to ensure the long-term conservation of the East Nimba Nature Reserve.

CÔTE D'IVOIRE

MOUNT NIMBA INTEGRAL NATURE RESERVE

Réserve naturelle intégrale du mont Nimba
Category Ia, strict nature reserve
Creation date: 1944
Area: 51 km²

PA Manager: *Office Ivoirien des Parcs et Réserves* (OIPR)
Development and management plan 2021-2030
Latest IMET evaluation: January 2024
Last IMET score: index 57.22



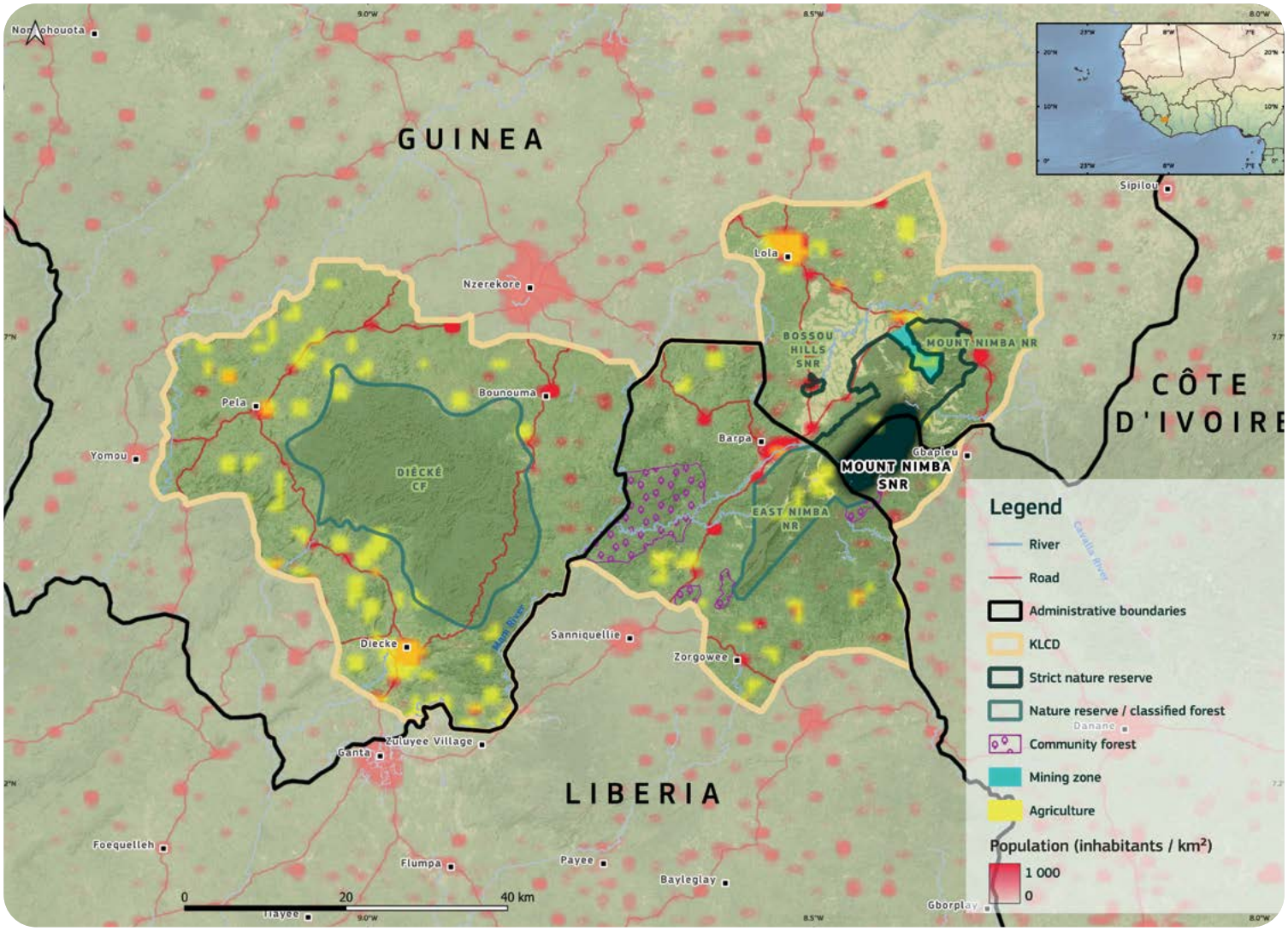
Contexte de gestion	Planification	Intrants	Processus	Resultats	Effects et Impacts	IMET index
81.4	72.3	38.1	42.5	50.93	58.1	57.22

MAIN HABITATS: The reserve stretches from an altitude of 500 m up to Mount Nimba at 1 752 m. Evergreen forests are found at a medium altitude and below 800 m. On the plains, exploitable tree species are frequently found, such as dabéma (Piptadeniastrum africanum, Fabaceae), ekki (Lophira alata, Ochnaceae) and *Entandrophragma* (Meliaceae). Above 800 m, the vegetation consists of montane forests rich in epiphytes and Guinea plum (Parinari excelsa, Chrysobalanaceae), as well as highland herbaceous zones with the dominant *Loudetia kagerensis* (Poaceae). The vegetation is rich in species endemic to low montane forests.

MAIN SPECIES (FAUNA, FLORA): The Mount Nimba Integral Nature Reserve hosts populations of western chimpanzees (*Pan troglodytes verus*), which use stones to break nuts. Other emblematic primates are also present: western red colobus (*Piliocolobus badius*), king colobus (*Colobus polykomos*), and Diana monkey (*Cercopithecus diana*). The Mount Nimba Integral Nature Reserve also includes endemic animal species such as the critically endangered Nimba otter shrew (*Micropotamogale lamottei*) and the critically endangered Nimba toad (*Nimbaphrynoides occidentalis*). Due to the region's seasonal and altitudinal contrasts, the endemic rates and the vegetal and animal diversity are very high.

OTHER CONSERVATION VALUES: Included in the MAB Reserve of Mount Nimba and forming a UNESCO WHS with its Guinean counterpart, the Mount Nimba Integral Nature Reserve has been recognised as an AZE site and is also an IBA. Moreover, the Mount Nimba range is a major water reserve with about 50 sources distributed between Guinea and Côte d'Ivoire.

MAIN THREATS: Poaching is rare in this region, and fortunately chimpanzees are not prey. The Guinean portion of the biosphere reserve, at the border with Côte d'Ivoire, holds large mining resources (iron), the exploitation of which would have dramatic consequences for both the



environment and the chimpanzees in the region. Due to the topography, the human population associated with this activity will probably remain in the Guinean part. Although fairly new in the region, cattle breeding is growing and savannahs are being used as pastures on the mountainsides. In addition to the potential impact on the environment, cattle breeding results in conflicts between farmers and cattle raisers when the animals damage crops.

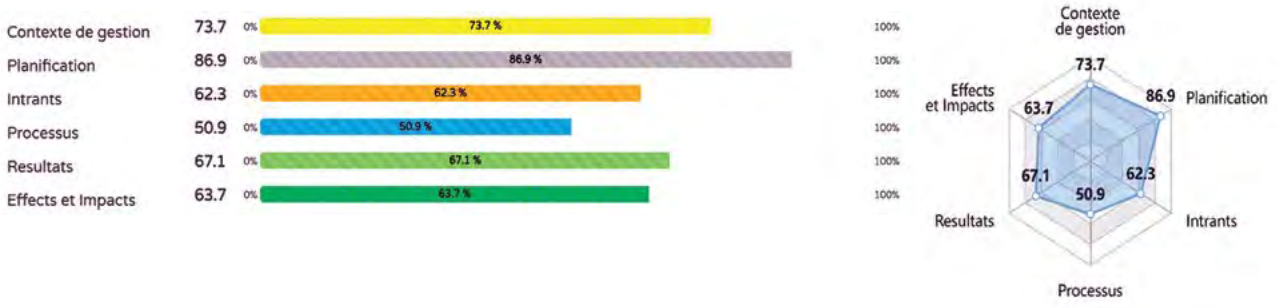
RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: It is necessary to reinforce the capacities of the management authorities, in terms of technical, human and financial resources, and to intensify surveillance in order to limit practices that lead to degradation and deforestation. A detailed plan must be designed and put in place with Guinea to remove the two reserves from the list of endangered WHSs.

3.5 TAÏ - GREBO-KRAHN - SAPO (TGKS)

CÔTE D'IVOIRE
TAÏ NATIONAL PARK

Parc national de Taï
Category II, national park
Creation date: 1972
Area: 5 082 km²

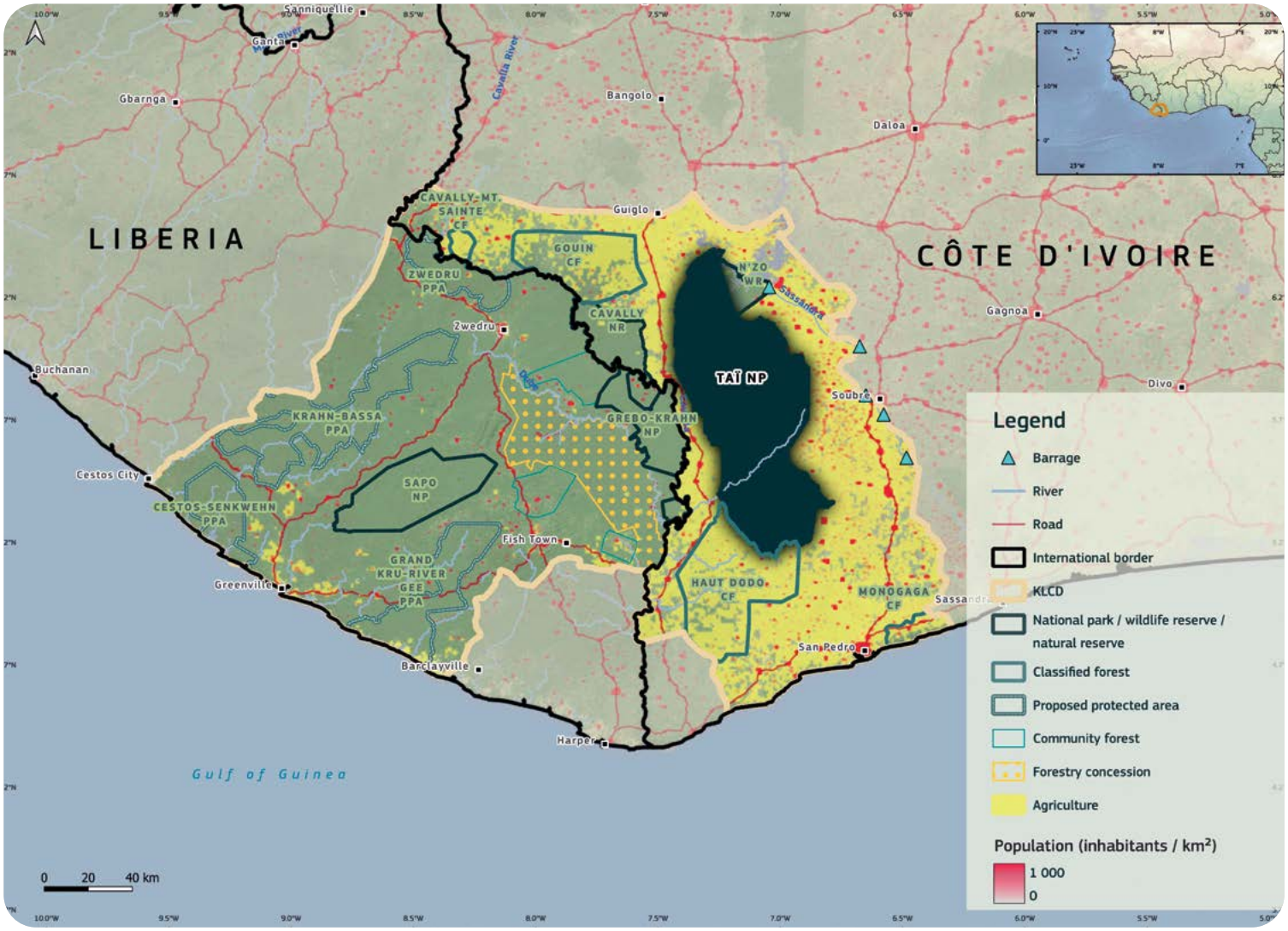
PA Manager: *Office Ivoirien des Parcs et Réserves* (OIPR)
Development and management plan 2020-2029 (integrating the N'Zo Wildlife Reserve within a process of joint management)
Latest IMET evaluation: 2024
IMET score: index 67.4



MAIN HABITATS: The Taï National Park comprises several volcanic inselbergs that culminate in a granitic plain. The Guinean evergreen rainforest is mature. There are two major forest types: dense rainforest with *Diospyros* spp. and *Mapania* spp. (Cyperaceae), and forest on a very wet clay soil, in the west-southwest of the park. The basic grouping of evergreen rainforest has rattan (*Eremospatha macrocarpa*, Arecaceae) and *Diospyros manii* (Ebenaceae).

MAIN SPECIES (FAUNA, FLORA): The Taï NP is one of the world's most important sites for the conservation of the pygmy hippopotamus (*Choeropsis liberiensis*) and western chimpanzee (*Pan troglodytes verus*). The animal population also includes forest elephant (*Loxodonta cyclotis*) and the three species of pangolin that live in West Africa. The forest is also home to a large variety of duikers including Jentink's duiker (*Cephalophus jentinki*) and zebra duiker (*C. zebra*). The leopard (*Panthera pardus*) and golden cat (*Caracal aurata*) are also found there. Several rare species of birds and/or species with restricted distribution are present: Shelley's eagle-owl (*Bubo shelleyi*), rufous fishing owl (*Scotopelia ussheri*), white-breasted guineafowl (*Agelastes meleagrides*), yellow-headed picathartes (*Picathartes gymnocephalus*), Nimba flycatcher (*Melaenornis annamarulae*), and western wattled cuckooshrike (*Lobotos lobatus*). The Taï NP is the only park in the world alongside the Gola Forest NP where the Taï toad (*Sclerophrys taiensis*), a critically endangered species endemic to the region, is still present.

More than 1 200 plant species have been identified in the park, including 160 endemic 'Sassandrian' species, especially in the facies zone with very wet clay soil in the south-southwest of the park. This indicates that the park is part of the Bas-Cavally centre of endemism, a flower hotspot also known as the Grabo hills, which crosses the Haute-Dodo Classified Forest. This feature dates back to dry climate periods during which the dense rainforest was reduced to a few isolated refuges, one of them being located on the border of Côte d'Ivoire and Liberia.



OTHER CONSERVATION VALUES: The Taï National Park is the largest protected forest area in West Africa.

MAIN THREATS: Poaching is one of the major threats faced by the national park. Two groups of animals are mainly targeted: duikers and monkeys, which are easy to hunt, transport and sell. Artisanal gold mining in the central eastern part of the park (and its associated chemical pollution which impacts the centre of the park), plus the development of cocoa trees, oil palm and rubber trees cause major deforestation, compounded by the demographic pressure associated with the migration of human labour. In particular, cocoa production grew after the decline of the first cocoa tree plantations in the east and then in the centre of the country (cocoa development fronts). Subsistence farming and fishing, undertaken in non-sustainable ways, increase with population growth. Human activities that have developed in the forests outside the park contribute to its isolation and to the fragmentation of the large forests.

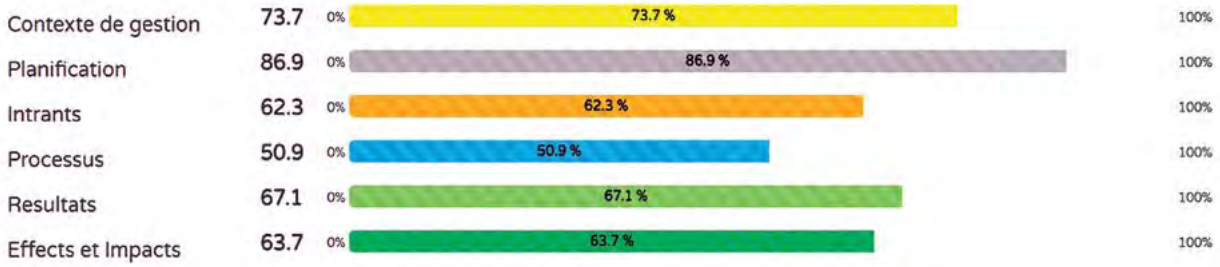
RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The Taï NP is relatively well preserved. However, the degradation of its periphery is a non-negligible threat. The socioeconomic development of the park's local communities and the implementation of environmental education programmes designed to inform the population about the link between well-being, development and conservation of the zone are essential; i.e. projects that concern the promotion of sustainable agriculture, agroforestry training, the supply of sustainable household energy, the development of responsible mining activities, and the creation of small wood plantations. Finally, it is urgent to finalise the creation of an ecological corridor between the Taï NP and the Grebo-Krahn National Park in Liberia, and to speed up the forest restoration process there.

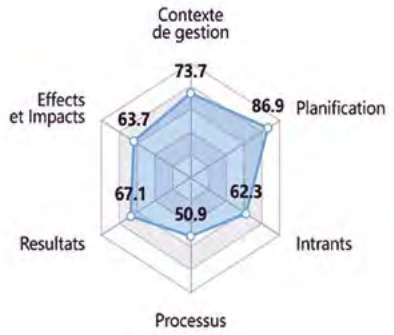
CÔTE D'IVOIRE

N'ZO PARTIAL WILDLIFE RESERVE

Réserve partielle de faune du N'Zo
Category IV, habitat or species management area
Creation date: 1972
Area: 278 km²

PA Manager: *Office Ivoirien des Parcs et Réserves* (OIPR)
Development and management plan 2020-2029 (integrated in the PAG of the Taï National Park due to joint management)
Last IMET evaluation: 2024
IMET score: index 67.4



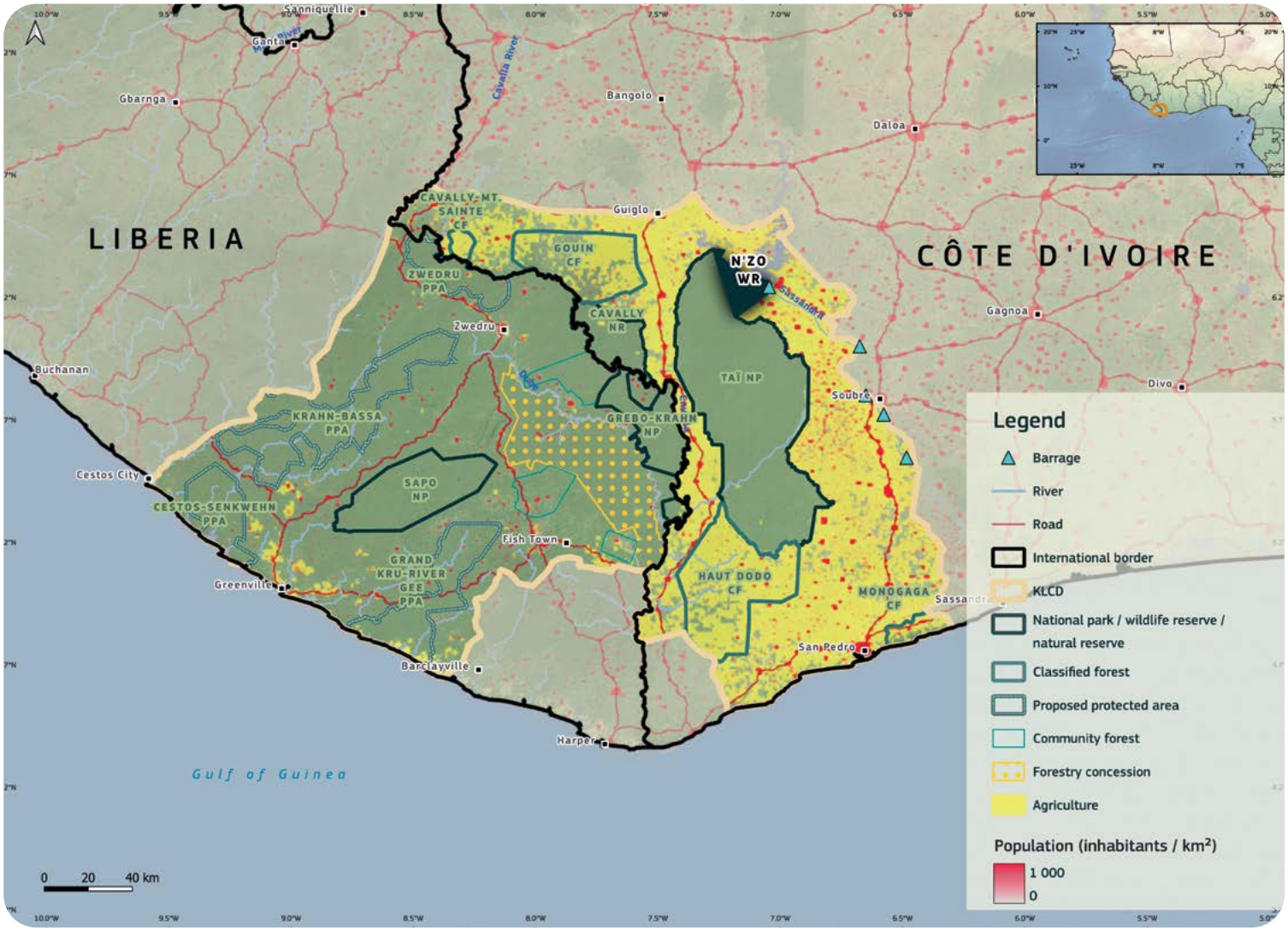


Contexte de gestion	Planification	Intrants	Processus	Resultats	Effects et Impacts	IMET index
73.7	86.9	62.3	50.9	67.08	63.7	67.43

MAIN HABITATS: The N'Zo forest forms part of the same forest block as the Taï National Park, sharing the same habitats. The reserve is on the edge of Lake Buyo, which comprises several aquatic habitats. The vegetation of the N'Zo Partial Wildlife Reserve is composed of dense Upper Guinean evergreen rainforest, with the following characteristic plant species: *Diospyros* spp. (including *Diospyros mannii*, Ebenaceae), *Mapania* spp. (Cyperaceae) and a rattan species (*Eremospatha macrocarpa*, Arecaceae). It is close to the transition with the semi-deciduous forest located further north/north east.

MAIN SPECIES (FAUNA, FLORA): Lake Buyo is a wintering or breeding site for numerous water bird species, including Hartlaub's duck (*Pteronetta hartlaubii*) and the African pygmy-goose (*Nettapus auritus*). During phase 15 (2021-2022) of ecological monitoring, signs of the presence of large mammals – such as buffalo (*Syncerus caffer nanus*), pygmy hippopotamus (*Choeropsis liberiensis*), certain duikers and tailed monkeys – were observed. Forest elephant (*Loxodonta* cyclotis) and western chimpanzee (*Pan troglodytes verus*) are close by.

Due to the distance from the hotspots of the Grabo Hills, endemic flora species are less frequent.



OTHER CONSERVATION VALUES: The N'Zo Partial Wildlife Reserve is recognised as an AZE site jointly with the Taï NP. The reserve contributes to the preservation of a large forest block, thus reinforcing the resilience of the Taï NP.

MAIN THREATS: Demographic and agricultural pressures are strong, due to the weak or poorly known conservation status of the reserve. An enclave granted for the construction of housing for employees of a forestry company (which has ended its activities) is still present within the N'Zo Partial Wildlife Reserve (village at the eastern boundary). The launch of the Soubré power dam in 2017 may constitute a major disturbance to the N'Zo reserve. Lake Buyo is also impacted by heavy anthropic pressures: poor fishing practices, chemical pollution and the growth of invasive species. Lower rainfall caused by climate change adds to these pressures.

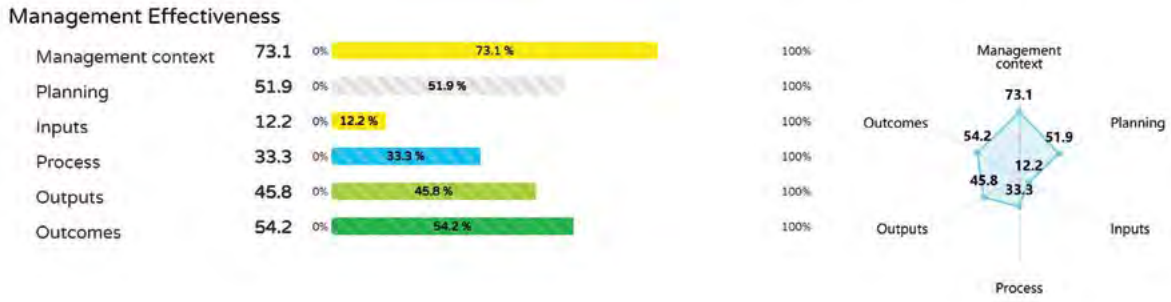
RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The improvement and preservation of the connectivity within the TGKS complex are very important for the conservation of this landscape. It is essential to control the pressure generated by the presence of human populations in the reserve (in ADK village and two fishing villages). The adequate implementation of two local agreements with the fishermen and merchants should make it possible to limit activities on Lake Buyo, at the edge of the reserve.

LIBERIA

GREBO-KRAHN NATIONAL PARK

Grebo-Krahn National Park
Category II, national park
Creation date: 9 October 2017
Area: 961.5 km²

PA Manager: Forestry Development Authority (FDA)
Development and management plan 2022-2026
Last IMET evaluation: 2024
IMET index: 45.1



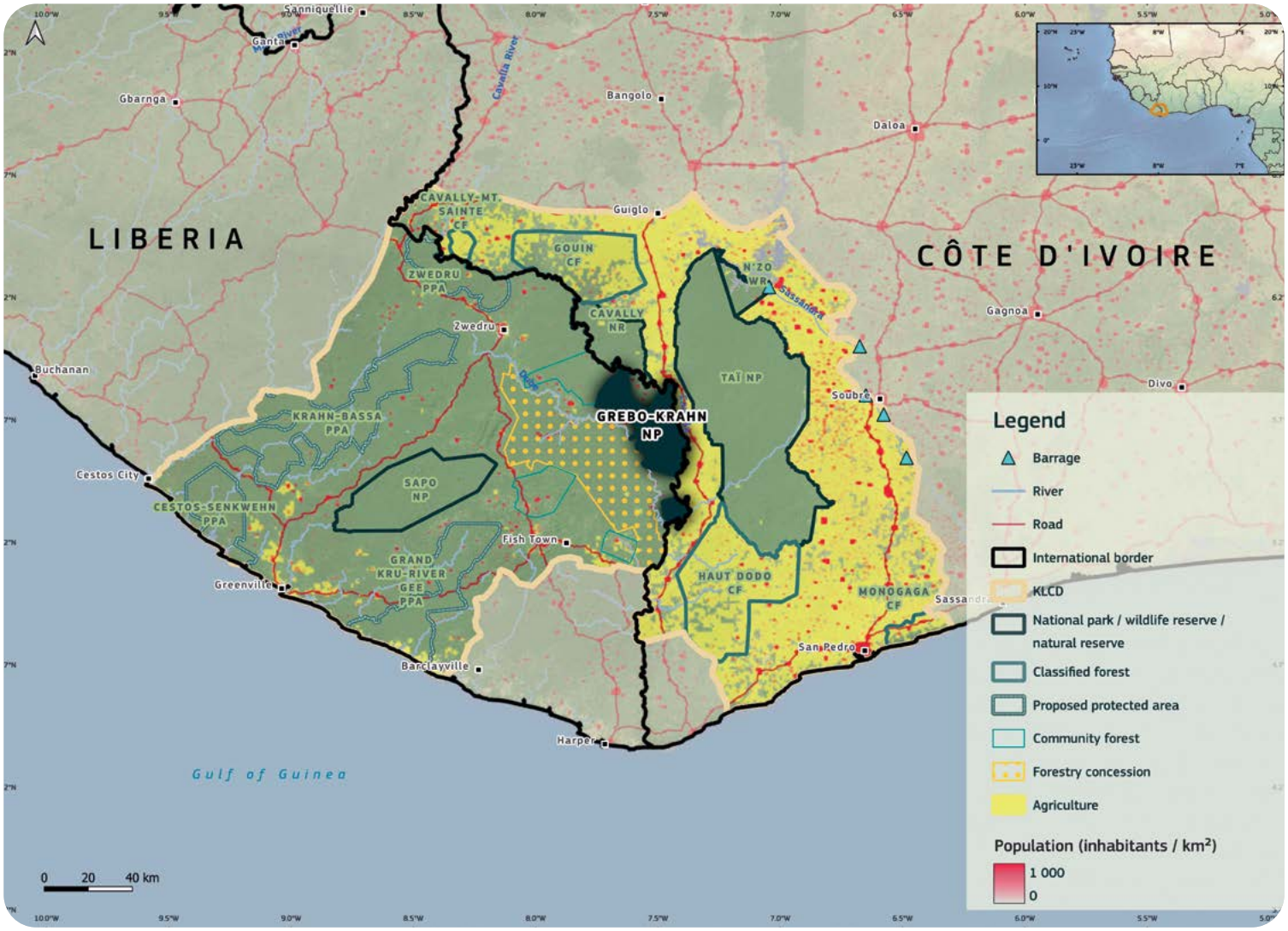
MAIN HABITATS: The Grebo-Krahn National Park is composed of two major types of dense evergreen rainforest: forest with very wet clay soil and *Diopsyros* spp. and *Mapania* spp. limited to the south block of the park; and evergreen forest with *Eremospatha macrocarpa* and *Diospyros mannii*, a fundamental grouping for evergreen forests.

The park also includes swamp forests and degraded forests. About 5 % of the park is still occupied today by cultivated zones.

MAIN SPECIES (FAUNA, FLORA): The Grebo-Krahn NP is host to several species of primates: western chimpanzee (*Pan troglodytes verus*), Diana monkey (*Cercopithecus diana*), and western red colobus (*Piliocolobus badius*). Other emblematic and/or endemic animal species are found in the park, such as pygmy hippopotamus (*Choeropsis liberiensis*), forest elephant (*Loxodonta cyclotis*), Jentink's duiker (*Cephalophus jentinki*) and leopard (*Panthera pardus*). The national park is important for the protection of the Liberian mongoose (*Liberiictis kuhni*) and Ballmann's malimbe (*Malimbus ballmanni*).

As in the Taï massif where more than 1 200 plant species have been identified, the park is host to 'Sassandrian' species (approximately 160), an indication that it is part of the Bas-Cavally centre of endemism, a flower hotspot also known as the Grabo hills and characteristic of forests with very wet clay soil. This feature dates back to dry climate periods during which the dense rainforest was reduced to a few isolated refuges, one of them at the border of Côte d'Ivoire and Liberia.

OTHER CONSERVATION VALUES: The complex formed by the Taï, Grebo-Krahn, and Sapo national parks is the largest forest massif in Upper Guinea and contributes to the preservation of this biodiversity hotspot.



MAIN THREATS: The exploitation by the local population of the national park's natural resources is a threat to its preservation. Hunting is widespread, together with the exploitation of *Garcinia afzelii* for traditional or modern (medicinal) ends. In addition, gold mining is a major cause of degradation. This is conducted in an artisanal or semi-artisanal way in the park's periphery, especially on the Cavally and Dugbe rivers, parts of which form the park's eastern and western boundaries. Agricultural pressure due to cocoa production is increasing all around the park with the development of a strong migratory flow from Côte d'Ivoire, encouraged by the aspirations of local populations for economic development thanks to this large workforce.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: With less than 10 agents, the Grebo-Krahn NP is understaffed to ensure law enforcement. It is therefore urgent to recruit eco-guards who also need to be trained and equipped. The development and management plan needs to be disseminated and used. Moreover, the connectivity between the two blocks of the national park will have to be made secure via a corridor along the Cavally River. It is urgent to secure the landscape connectivity within the Taï – Grebo-Krahn – Sapo complex, especially by reforestation so as to reconnect the forests and animal populations of the Grebo-Krahn and Taï NPs. In parallel, it is necessary to develop sustainable socioeconomic activities in order to improve the well-being of the local communities while preserving the forest ecosystem, and ensuring a fair distribution of the conservation benefits among these populations.

LIBERIA

SAPO NATIONAL PARK

Sapo National Park
Currently not recognised by the IUCN
Creation date: 1983
Area: 1 804 km²

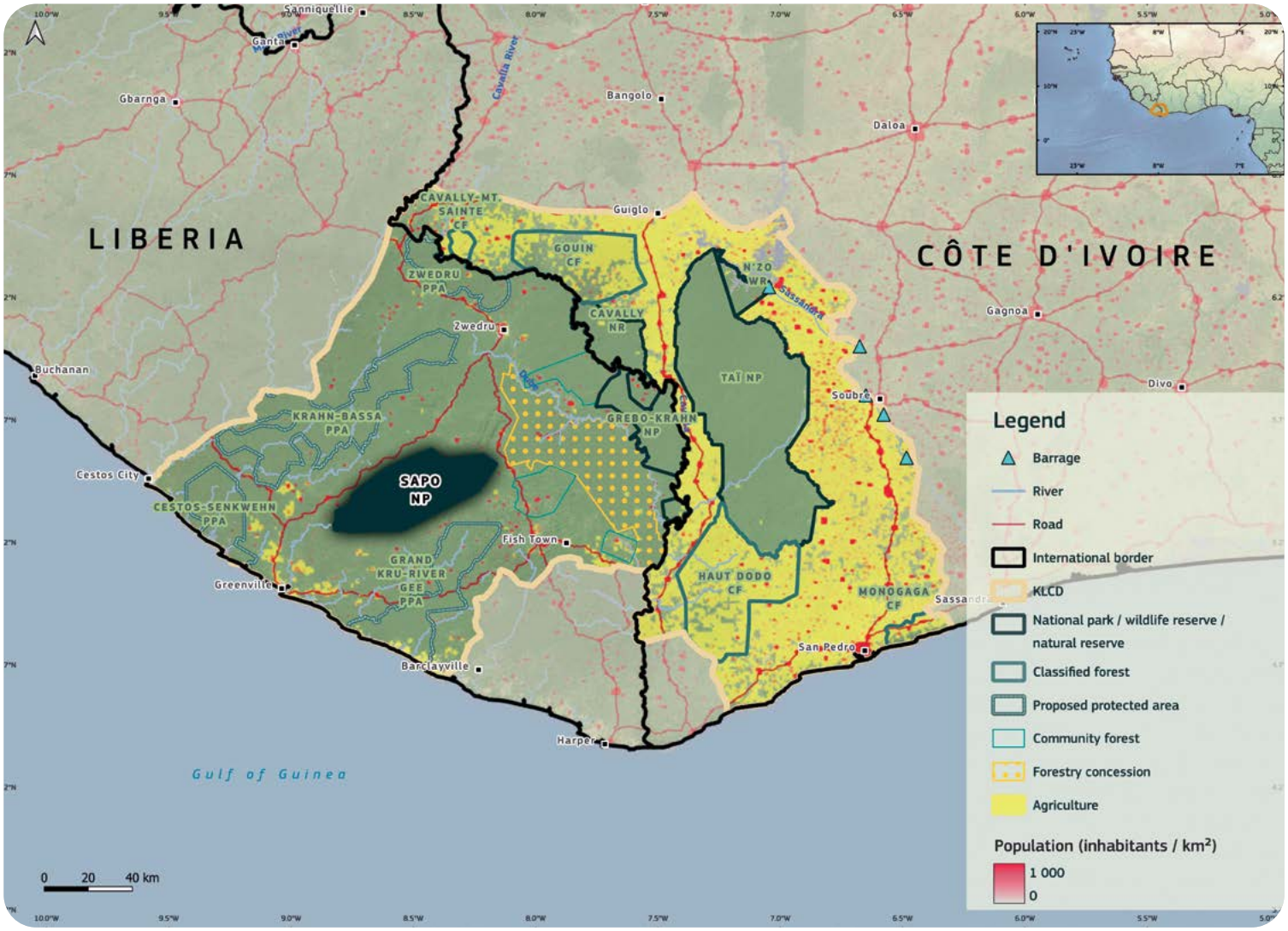
PA Manager: Forestry Development Authority (FDA)
Development and management plan available (2021-2026) but not yet disseminated
Last IMET evaluation: late 2023
IMET index: 45.3

MAIN HABITATS: Sapo National Park consists mainly of dense evergreen rainforest with closed canopies, but also includes old secondary forests, swamp forests, and floodplain forests along the waterways. Tree species include *Tetraberlinia tubmaniana, Gilbertiodendron splendidum* and *Brachystegia leonensis*. The park lies between 100 m and 400 m above sea level, with some steep hills in the north.

MAIN SPECIES (FAUNA, FLORA): The park is home to several species of mammal that are emblematic of the forests of Upper Guinea: forest elephant (*Loxodonta cyclotis*), western chimpanzee (*Pan troglodytes verus*) and pygmy hippopotamus (*Choeropsis liberiensis*) in particular. Numerous species of primates can be found here. Duikers are well represented with six species, including Jentink's duiker (*Cephalophus jentinki*) and the zebra duiker (*Cephalophus zebra*). This is one of the few places where the Liberian mongoose (*Liberiictis kuhni*) is found. Among the birds with restricted distribution, the park is home to white-breasted guineafowl (*Agelastes meleagrides*), yellow-headed picathartes (*Picathartes gymnocephalus*) and Ballmann's malimbe (*Malimbus ballmanni*). Several endemic plant species are present: *Cercestis taiensis* (Araceae), *Sciaphila africana* (Triuridaceae), Cnestis bomiensis (Connaraceae) and *Okoubaka aubrevillei* (Santalaceae).

OTHER CONSERVATION VALUES: Sapo NP is recognised as a KBA and an IBA. Sapo and its surroundings form an ecosystem that provides the resources necessary for the subsistence of local communities.

MAIN THREATS: The threats to Sapo are poaching, and artisanal and illegal gold mining. Thousands of people are illegally settling in the park, and have to be regularly evacuated in conjunction with the FDA and traditional authorities. In the buffer zone and neighbouring forests,



agricultural development and commercial logging are significant and have an impact on the connectivity of the forest ecosystem. Human-wildlife conflicts are frequent in the area and are exacerbated by the reduction in forest habitats. An iron ore mining project in the Putu Mountains would require the construction of a new railway line to the coast, which would pass close to the park.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The development of income generating activities (IGAs) is necessary to provide an alternative to the unsustainable exploitation of natural resources, in particular hunting, with the communities established on the outskirts of the Sapo NP. Equitable sharing of the benefits of conservation is also very important. Improving the capacity of the FDA, as well as its logistical resources and infrastructure (including road infrastructure), would help to improve the effectiveness of park management, in particular the fight against illegal activities, and its governance. On a broader scale, strengthening law enforcement at the national level would ensure that sanctions are applied in the event of poaching, and thus improve the effectiveness of anti-poaching initiatives. The efforts made to develop ecotourism through the creation of a superb lodge at one of the park's entrances must be continued and expanded to benefit local communities, following the example of what is being done to the west of Taï National Park in Côte d'Ivoire.

*A western blue-tailed tree lizard (*Holaspis guentheri*) in Krahn-Bassa. (© WCF/Mark-Oliver Roedel)*

LIBERIA

KRAHN-BASSA PROPOSED PROTECTED AREA – PROPOSED KWA NATIONAL PARK

Krahn-Bassa Proposed Protected Area – proposed Kwa National Park
Creation process underway
Area: 2 071 km²

PA Manager: Forestry Development Authority (FDA)
Management plan expected in 2025

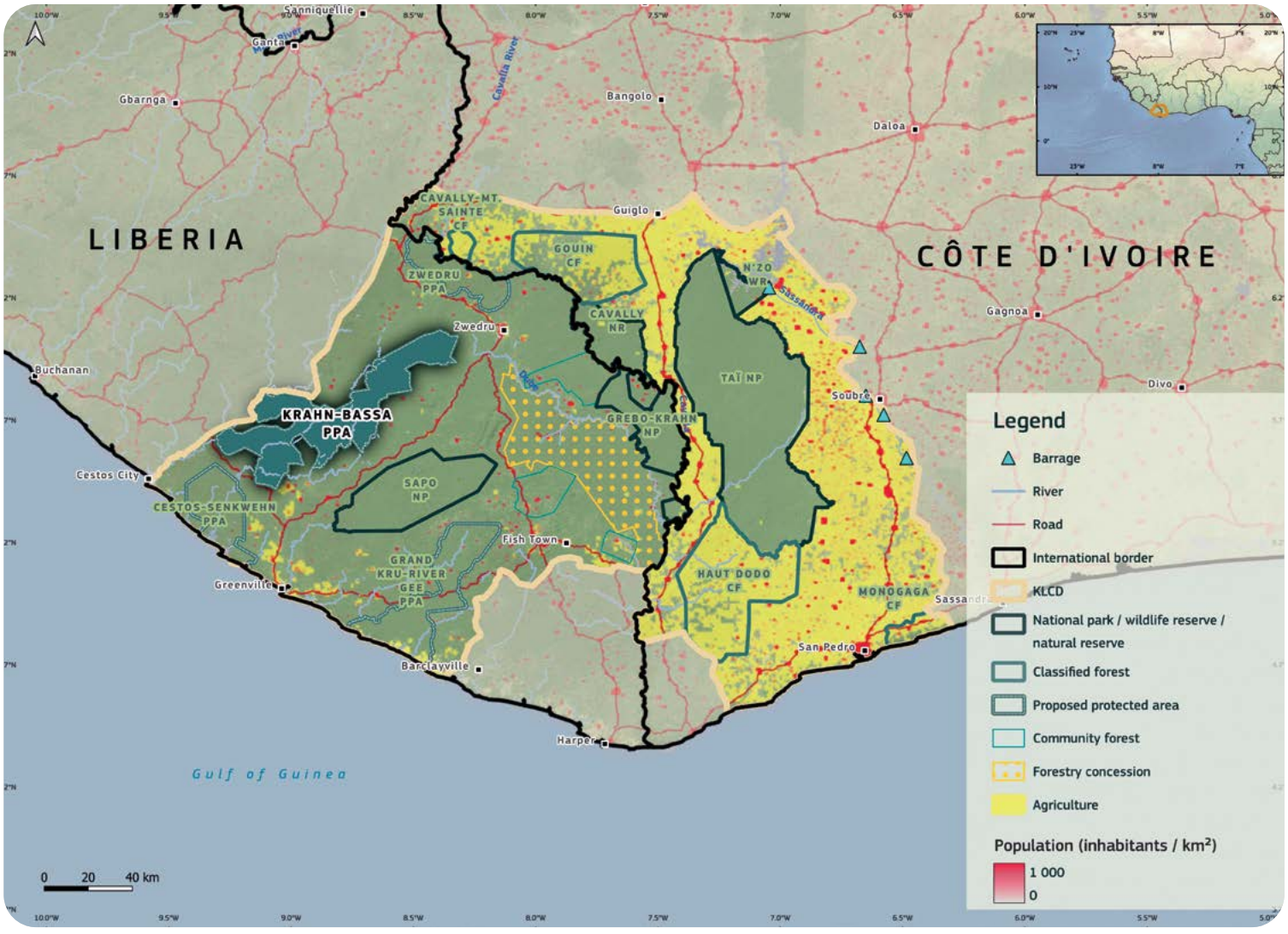
MAIN HABITATS: The proposed Kwa National Park is composed of dense tropical rainforest.

MAIN SPECIES (FAUNA, FLORA): Krahn-Bassa's animal diversity is significant. The site is home to one of the largest populations of chimpanzee in West Africa (*Pan troglodytes verus*), as well as nine other primate species. Pygmy hippopotamus (*Choeropsis liberiensis*), forest elephant (*Loxodonta cyclotis*), Jentink's duiker (*Cephalophus jentinki*), zebra duiker (*Cephalophus zebra*), Liberian mongoose (*Liberiictis kuhni*), western red colobus (*Procolobus badius*) and leopard (*Panthera pardus*) are also present. Several species new to science have been discovered here: a frog (*Phrynobatrachus aff. alleni*) and a tree species (*Didelotia gracillima*, Fabaceae). Others were observed there for the first time in Liberia (such as the western neon blue-tailed tree lizard (*Holaspis guentheri*)). *Uvariodendron occidentale* (Annonaceae) is another plant species of interest in Krahn-Bassa.

OTHER CONSERVATION VALUES: The proposed Krahn-Bassa protected area is considered to be the site with the greatest biodiversity in Liberia and its southern part (Krahn-Bassa South) is recognised as a KBA. It is home to two new species of frog (*Ptychadena* sp.). The area's chimpanzee population uses stones to crack nuts.

MAIN THREATS: The main human activity threatening the conservation of the proposed Kwa NP is hunting, for which there is abundant evidence within the forest. Artisanal gold mining has also taken place there.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Completing the process of creating the Kwa NP is the first step towards improving its conservation status. The most important actions to be taken are the involvement of local communities living in and around the protected area in developing a chimpanzee protection strategy, setting up alternative employment opportunities to hunting and the bushmeat trade, and defining an equitable sharing of the benefits linked to conservation. Environmental education and awareness-raising programmes also need to be put in place. The number of rangers needs to be increased, and they need to be trained and better equipped. Activities to support the sustainable development of local communities need to be stepped up, as do awareness-raising activities.


LIBERIA
CÔTE D'IVOIRE
Gulf of Guinea
Sanniquellie
Ganta
Gbarnga
Bangolo
Daloa
Guiglo
Gagnoa
Divo
Soubré
Buchanan
Zwedru
Cestos City
Fish Town
Greenville
Barclayville
Harper
San Pedro
Sassandra
Cavalla River
CAVALLY-MT. SAINTE CF
GOUIN CF
ZWEDRU PPA
CAVALLY NR
N'ZO WR
TAÏ NP
GREBO-KRAHN NP
KRAHN-BASSA PPA
SAPO NP
CESTOS-SENKWEHN PPA
GRAND KRU-RIVER GEE PPA
HAUT DODO CF
MONOGAGA CF
Legend
Barrage
River
Road
International border
KLCD
National park / wildlife reserve / natural reserve
Classified forest
Proposed protected area
Community forest
Forestry concession
Agriculture
Population (inhabitants / km²)
1 000
0
0 20 40 km

3.6 CROSS RIVER

NIGERIA

CROSS RIVER NATIONAL PARK

Cross River National Park
Category II, national park
Creation date: 1991
Area: 3 640 km²

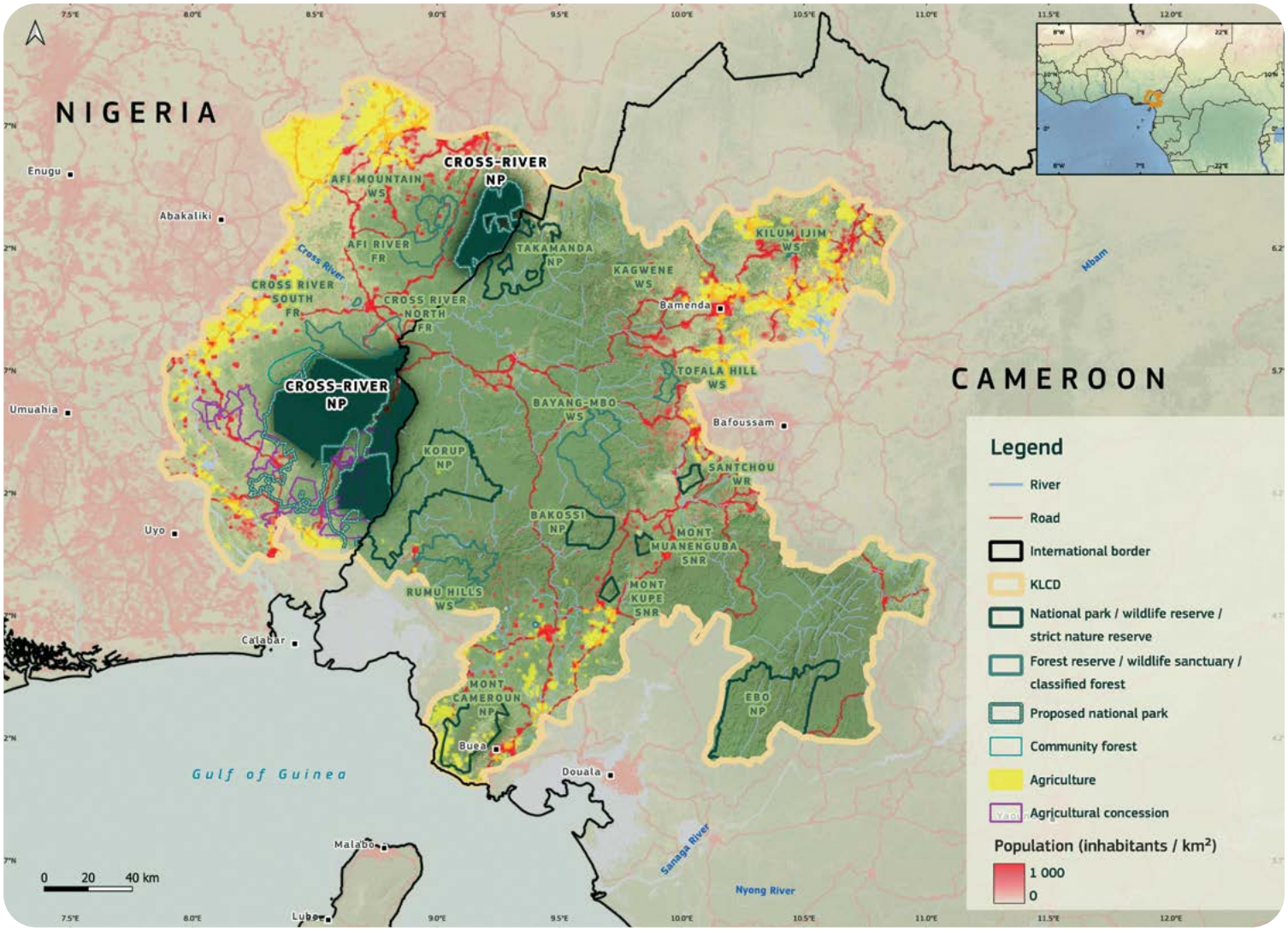
PA Manager: Nigeria National Park Service (NNPS)
Previous development and management plan expired; new development and management plan expected in 2025
Last METT evaluation in February 2022 (Monitoring Effectiveness Tracking Tool)
Last METT score: 67.5 (Okwango division: 69; Oban division: 66)

MAIN HABITATS: The Cross River National Park is divided into two areas: Oban in the south (3 000 km²) and Okwango in the north (640 km²). The Oban division is a watershed with hills of up to 500 m, culminating at an altitude of 1 000 m. The Okwango division contains dense lowland and highland rainforests, with altitudes ranging from 150 to 1 700 m.

MAIN SPECIES (FAUNA, FLORA): A particularly important site for great ape populations, Cross River NP is home to the critically endangered Cross River gorilla (*Gorilla gorilla diehli*) and the endangered Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*), both endemic to the forests of Lower Guinea. Other primates such as endangered drill (*Mandrillus leucophaeus*), Preuss's red colobus (*Procolobus preussi*), and crested monkey (*Cercopithecus pogonias*) are found here, as well as leopard (*Panthera pardus*), forest elephant (*Loxodonta cyclotis*), grey-necked picathartes (*Picathartes oreas*), and slender-snouted crocodile (*Mecistops cataphractus*).

OTHER CONSERVATION VALUES: The Oban and Okwango divisions of Cross River NP have been designated as biosphere reserves, forming the largest undisturbed forest massif in Nigeria. They are proposed for inclusion in UNESCO's list of World Heritage Sites as a transboundary site with Cameroon's Korup and Takamanda parks, together known as CRIKOT (Cross River – Korup – Takamanda). The Oban division is one of the sites of exceptional priority for chimpanzee conservation, and the Okwango division is home to the largest population of Cross River gorillas (*Gorilla gorilla diehli*). The Oban Hills are an important centre of diversity and endemism, especially for primates, amphibians, butterflies, dragonflies, fish and small mammals.

MAIN THREATS: The region is densely populated, leading to extensive conversion of forest to farmland and intensive exploitation of natural resources. The development of commercial plantations of oil palm, rubber trees, cashew nuts and pineapples around, and even within, Cross River NP has led to heavy deforestation. The level of bushmeat hunting is very high, which has led to a sharp reduction in animal populations, accompanied by a highly developed cross-border trade with Cameroon. Large-scale poaching for ivory is also widespread and illegal logging is a significant activity. Plans to build a motorway in Cross River State, although abandoned under public pressure and due to lack of funds, remain a significant threat. A major threat that has emerged recently is illegal mining activity in the Oban division.



RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Protection measures need to be stepped up. It is important to revoke illegal mining concessions, and improve the training and equipment of park officers. A better redistribution of the benefits of conservation and the integration of local communities into conservation actions, coupled with the development of income-generating activities, would help to alleviate conflicts with local populations and the encroachment of agricultural land into the park. Existing environmental education and awareness-raising programmes need to be strengthened. The initiative to create a transboundary WHS with Korup and Takamanda in Cameroon (CRIKOT) should continue to be supported. Another priority is to harmonise the boundaries as they appear in legal texts with how they are recognised on the ground.

Aerial view of the Afi River Forest Reserve in Cross River State, Nigeria. (© David Nkwa (Nkwafilms), via Wikimedia Commons, CC BY-SA 4.0)

NIGERIA

AFI RIVER FOREST RESERVE

Afi River Forest Reserve
Category V, protected landscape
Creation date: 1930
Area: 312 km²

PA Manager: Cross River State Forestry Commission
Development and management plan not available
No IMET evaluation available
Last IMET score: /

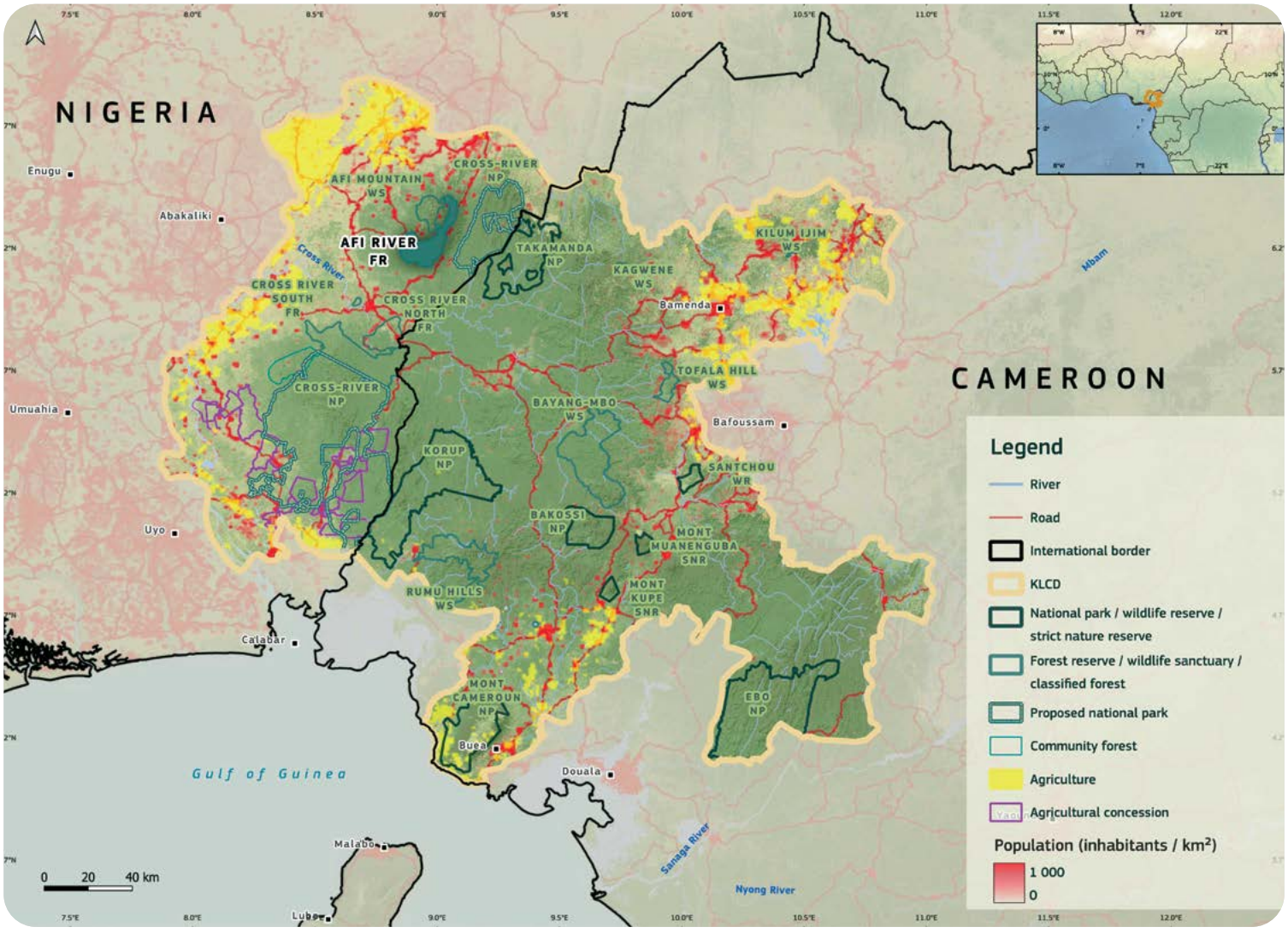
MAIN HABITATS: The Afi River Forest Reserve is made up of dense lowland rainforest at altitudes of between 200 and 300 m. The plant species that dominate the forests of this reserve are ilomba (*Pycnathus angolensis*, Myristicaceae) and niové (*Staudtia kamerunensis*, Myristicaceae). The Fabaceae are also well represented, including ebiara (*Berlinia grandiflora*), naga (*Brachystegia eurycoma*) and mepepe (*Albizia zygia*).

MAIN SPECIES (FAUNA, FLORA): A number of species with conservation value have been observed in the past, including drill (*Mandrillus leucophaeus*) and red-eared monkey (*Cercopithecus erythrotis*), as well as forest elephant (*Loxodonta cyclotis*), traces of which have been observed in the south of the reserve. A survey in 2008 was unable to confirm the presence of drills or elephants, but found significant signs of poaching. The avifauna is particularly rich and diverse, including grey-necked picathartes (*Picathartes oreas*), which is thought to breed in the reserve, white-crested bittern (*Tigriornis leucolophus*), long-tailed hawk (*Urotriorchis macrourus*), and the rare black spinetail (*Telacanthura melanopygia*).

OTHER CONSERVATION VALUES: The Afi River Forest Reserve is recognised as an IBA. It forms an important link between the Afi Mountain Wildlife Sanctuary and the Mbe Wildlife Sanctuary.

MAIN THREATS: The Afi River Forest Reserve is undergoing major disturbances, having been heavily impacted by illegal farming and logging activities. Hunting is highly developed, leading to a sharp decline in animal populations. Bushfires in the dry season have caused damage, including a major fire in 1989. In general, the forest ecosystem is degraded and fragmented.

RECOMMENDATIONS AND INTERVENTION PRIORITIES 2025-2030: Various actions need to be carried out with local communities. There is a need to develop a multi-stakeholder consultation platform that includes environmental education, raising awareness and the creation of income-generating activities as alternatives to logging. In order to ensure that the laws are applied, capacity building and the motivation of agents, particularly through adequate salaries, must be considered. Actions to restore degraded areas should also be implemented.


NIGERIA
CAMEROON
Enugu
Abakaliki
Umuahia
Uyo
Calabar
Bamenda
Bafoussam
Buea
Douala
Malabo
Lubo
Gulf of Guinea
Cross River
Mbam
Sanaga River
Nyong River
AFI MOUNTAIN WS
CROSS-RIVER NP
AFI RIVER FR
TAKAMANDA NP
KILUM IJIM WS
KAGWENE WS
CROSS RIVER SOUTH FR
CROSS RIVER NORTH FR
CROSS-RIVER NP
TOFALA HILL WS
BAYANG-MBO WS
KORUP NP
SANTCHOU WR
BAKOSSI NP
MONT MUANENGUBA SNR
RUMU HILLS WS
MONT KUPE SNR
MONT CAMEROUN NP
EBO NP
0 20 40 km
Legend
River
Road
International border
KLCD
National park / wildlife reserve / strict nature reserve
Forest reserve / wildlife sanctuary / classified forest
Proposed national park
Community forest
Agriculture
Agricultural concession
Population (inhabitants / km²)
1 000
0

*The Afi Mountain Wildlife Sanctuary is the most protected area in the world for the drill (*Mandrillus leucophaeus*). (Thomas Marent/ Minden Pictures/ Alamy)*

NIGERIA

AFI MOUNTAIN WILDLIFE SANCTUARY

Afi Mountain Wildlife Sanctuary
Category IV, habitat or species management area
Creation date: 2000
Area: 100 km²

PA Manager: Cross River State Forestry Commission
Development and management plan not available
Last METT evaluation in February 2022
Last METT score: 45

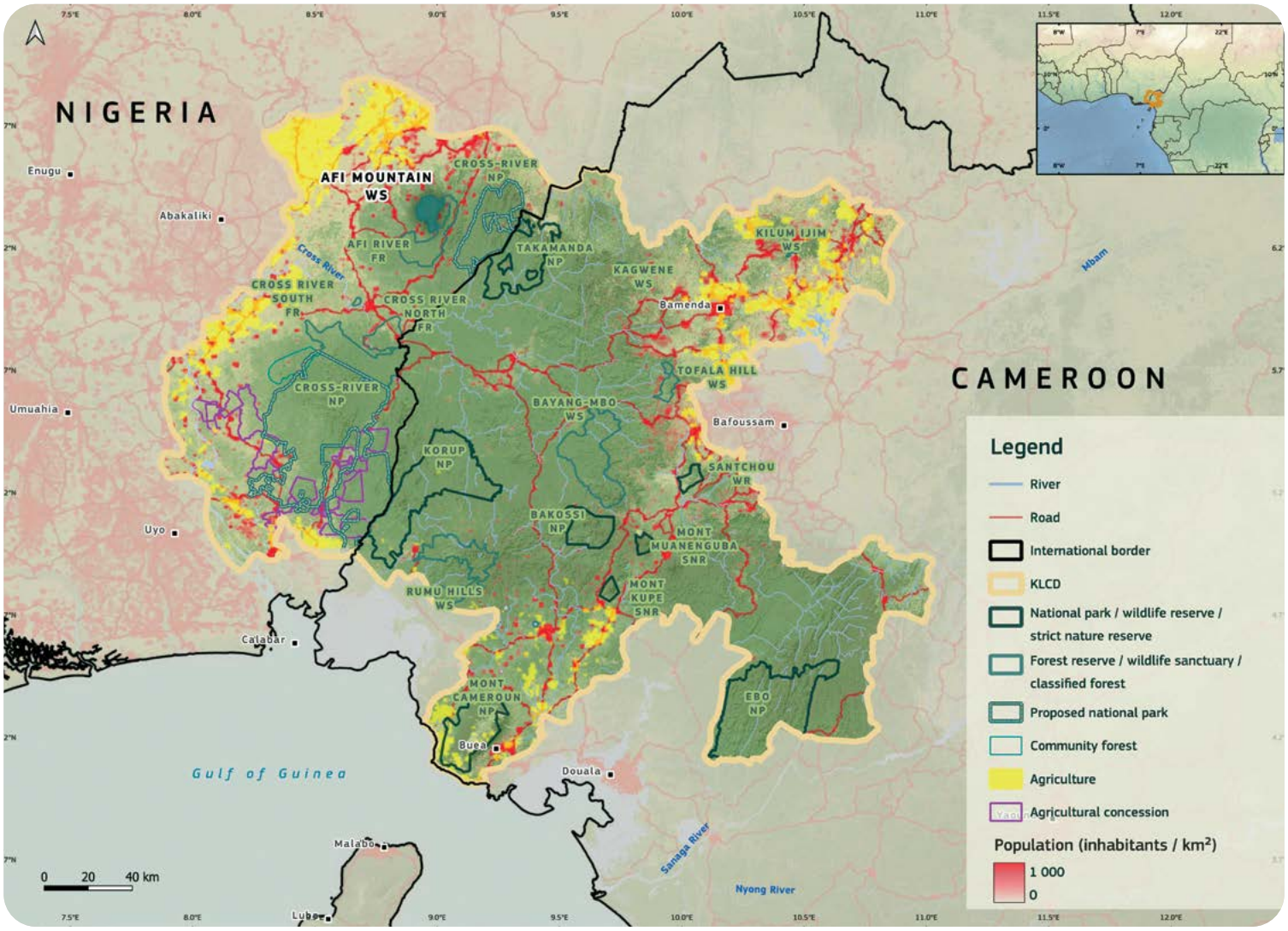
MAIN HABITATS: The Afi Mountain Wildlife Sanctuary is made up of dense lowland rainforest and sub-montane forests. Rocky peaks with steep slopes can be found here, culminating at altitudes of up to 1 300 m.

MAIN SPECIES (FAUNA, FLORA): Several endangered primate species inhabit this PA, including Cross River gorilla (*Gorilla gorilla diehli*), also endemic to the region, Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*), and drill (*Mandrillus leucophaeus*). The grey-necked picathartes (*Picathartes oreas*) is another emblematic species found in this protected area.

OTHER CONSERVATION VALUES: The Afi complex is one of the top priority sites for chimpanzee conservation. The western side of the mountain is the largest passage site for barn swallows (*Hirundo rustica*) during their winter migration from Europe. It forms part of the CRIKOT site, proposed as a WHS by UNESCO, along with the Cross River NP.

MAIN THREATS: Agricultural activities, logging, and the presence of an asphalt road linking Afi to the Mbe Mountains Community Forest all contribute to the risk of isolating the Afi Mountain Wildlife Sanctuary from other surrounding forest areas. Within the sanctuary, the rugged terrain has helped to protect the forest from logging, but not from the bushfires used to clear the forest cover and convert it to farmland. Cocoa and banana plantations are present in the sanctuary. Illegal hunting is relatively common, mainly using snares.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Securing the connectivity of the region's forest habitats is important, as is combating all agricultural activity within the Afi Mountain Wildlife Sanctuary. In connection with this last point, collaboration with local communities is essential, through environmental education initiatives, support for the development of income-generating activities compatible with the sustainable conservation of the forest ecosystem, and in particular the development of ecotourism.


NIGERIA
CAMEROON
Enugu
Abakaliki
Umuahia
Uyo
Calabar
Buea
Douala
Bafoussam
Bamenda
Malabo
Lubre
Gulf of Guinea
Cross River
Mbam
Sanaga River
Nyong River
AFI MOUNTAIN WS
CROSS-RIVER NP
AFI RIVER FR
CROSS RIVER SOUTH FR
CROSS RIVER NORTH FR
CROSS-RIVER NP
TAKAMANDA NP
KAGWENE WS
KILUM IJIM WS
TOFALA HILL WS
BAYANG-MBO WS
KORUP NP
SANTCHOU WR
BAKOSSI NP
MONT MUANENGUBA SNR
MONT KUPE SNR
RUMU HILLS WS
MONT CAMEROUN NP
EBO NP
0 20 40 km
Legend
River
Road
International border
KLCD
National park / wildlife reserve / strict nature reserve
Forest reserve / wildlife sanctuary / classified forest
Proposed national park
Community forest
Agriculture
Agricultural concession
Population (inhabitants / km²)
1 000
0

The Ime River in the Oban Division of Cross River National Park. (© Dotun55, CC BY-SA 4.0, via Wikimedia Commons)

NIGERIA

CROSS RIVER SOUTH FOREST RESERVE

Cross River South Forest Reserve
Category V, protected landscape
Creation date: 1930
Area: 350 km²

PA Manager: Cross River State Forestry Commission
Development and management plan not available
No IMET evaluation available

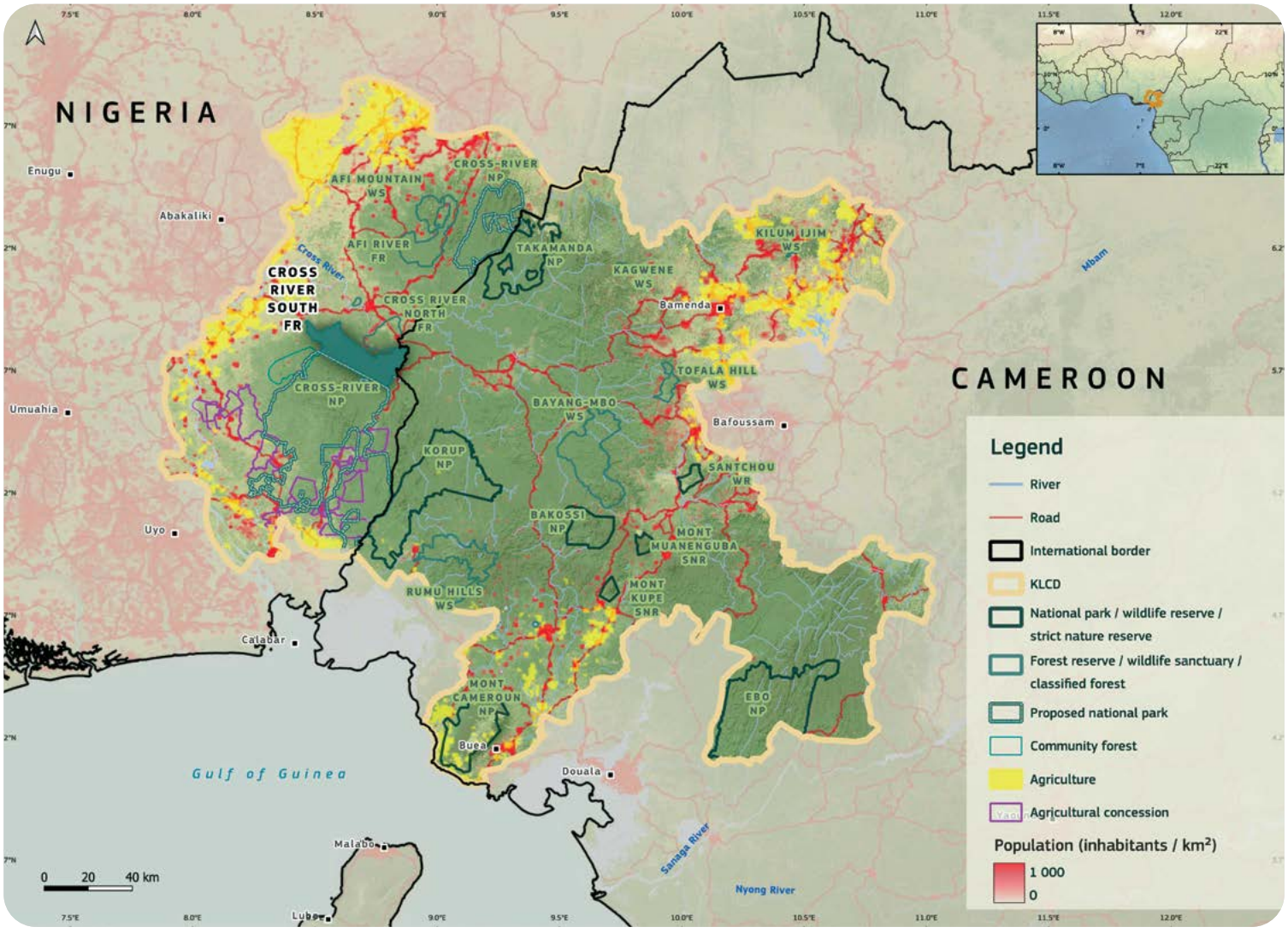
MAIN HABITATS: The Cross River South Forest Reserve is made up of dense tropical rainforest that has nevertheless been heavily degraded by agriculture.

MAIN SPECIES (FAUNA, FLORA): There is very little information on the biodiversity of the reserve, but as it is directly adjacent to the Cross River National Park it is likely that the majority of the park's key species are also found in the reserve. The level of degradation is such that it is uncertain whether any flagship species remain, at least among large mammals.

OTHER CONSERVATION VALUES: Located to the north of the Oban division of the Cross River NP, the reserve forms a link between the Oban division and the northern forests of Cross River State. It thus increases the resilience of this forest block.

MAIN THREATS: The forest of the Cross River South Forest Reserve has been severely degraded by traditional subsistence farming, mainly for cocoa, and commercial logging. At present, poaching by peripheral populations is a major threat to animal communities. Despite the ban on logging declared throughout Cross River State in 2008, forest degradation and conversion continue. The development of oil palm and cocoa plantations is particularly significant.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Given the degraded nature of the reserve, the implementation of forest restoration and subsequent management actions would make it possible to improve the conservation of the Cross River South Forest Reserve. In the early 1990s, it was proposed that the southern part of the reserve be incorporated into Cross River National Park, but this was never done.


NIGERIA
CAMEROON
Enugu
Abakaliki
Umuahia
Uyo
Calabar
Bamenda
Bafoussam
Buea
Douala
Malabo
Lubbe
Gulf of Guinea
Cross River
Mbam
Senaga River
Nyong River
CROSS RIVER SOUTH FR
CROSS RIVER NORTH FR
AFI RIVER FR
AFI MOUNTAIN WS
CROSS-RIVER NP
TAKAMANDA NP
KAGWENE WS
KILUM IJIM WS
TOFALA HILL WS
BAYANG-MBO WS
KORUP NP
SANTCHOU WR
BAKOSSI NP
MONT MUANENGUBA SNR
MONT KUPE SNR
RUMU HILLS WS
MONT CAMEROUN NP
EBO NP
0 20 40 km
Legend
River
Road
International border
KLCD
National park / wildlife reserve / strict nature reserve
Forest reserve / wildlife sanctuary / classified forest
Proposed national park
Community forest
Agriculture
Agricultural concession
Population (inhabitants / km²)
1 000
0

3.7 PROTECTED AREAS OUTSIDE THE PAPFOR LANDSCAPES

CÔTE D'IVOIRE
BANCO NATIONAL PARK

Parc national du Banco
Category II, national park
Creation date: 1953
Area: 34 km²

PA Manager: *Office Ivoirien des Parcs et Réserves* (OIPR)
Development and management plan 2019-2028
No IMET evaluation conducted
https://panorama.solutions/es/building-block/evaluation-de-la-gestion-du-pnb

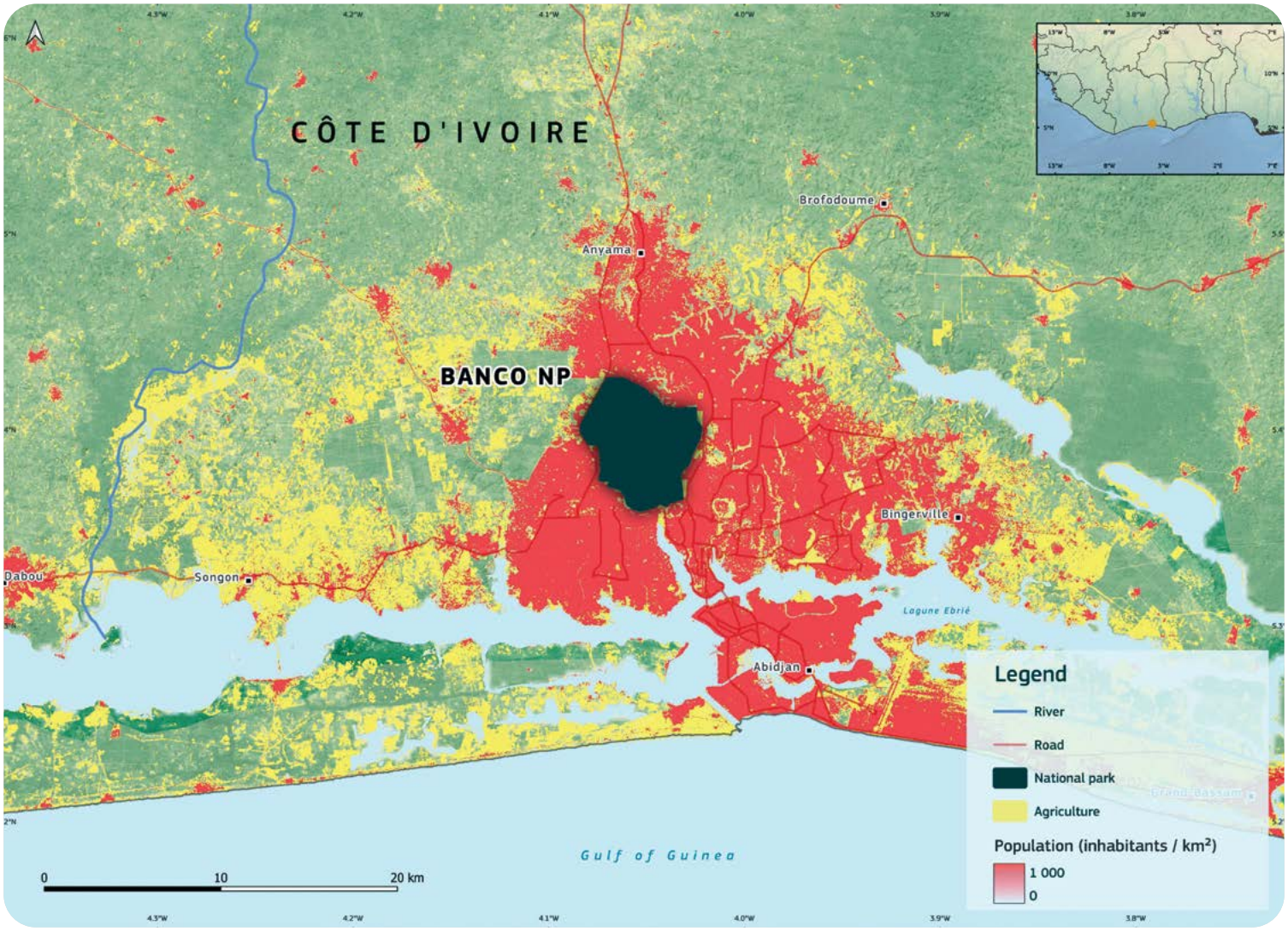
MAIN HABITATS: Most of the Banco National Park consists of mature dense rainforest, which forms a mosaic with areas of secondary forest that are being restored and areas of forest planted with commercial species.

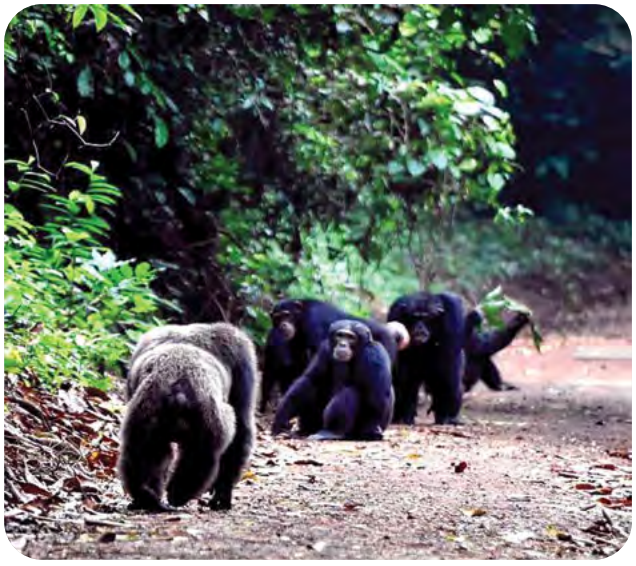
MAIN SPECIES (FAUNA, FLORA): Several commercial plant species, derived from silviculture trials carried out from the 1920s onwards, are present and illustrate the composition of the Guinean forests: azobe (*Lophira alata*, Ochnaceae), bahia (*Mitragyna ledermannii*, Rubiaceae), humpback (*Leplaea cedrata*, Meliaceae), abalé (*Petersianthus macrocarpus*, Lecythidaceae), mahogany (*Khaya ivorensis*, Meliaceae), makoré (*Tieghemella heckelii*, Sapotaceae), sipo (*Entandrophragma utile*, Meliaceae), adjouaba (*Dacryodes klaineana*, Burseraceae), avodiré (*Turraeanthus africanus*, Meliaceae), iroko (*Milicia regia*, Moraceae) and white tiama (*Entandrophragma angolense*, Meliaceaea). Teak (*Tectona grandis*, Lamiaceae), a commercial species native to Asia, was also introduced as part of these trials. A very small population of western chimpanzee (*Pan troglodytes verus*) remains, as does Lowe's monkey (*Cercopithecus lowei*). The park is home to 199 bird species, many of which are representative of Guinean forests.

OTHER CONSERVATION VALUES: Banco NP is a site where local people support conservation initiatives. Located in the immediate vicinity of Abidjan, it is an important site for environmental education and is home to an arboretum of over 800 species of higher plants from the tropical regions of Africa, Asia and Latin America. It also protects the water table that provides Abidjan's drinking water and is considered the city's 'green lung'.

MAIN THREATS: Due to its proximity to the country's economic capital, Banco NP is threatened by urbanisation, property speculation, the conversion of land into residential areas, the development of peri-urban agriculture and the exploitation of fuelwood. A number of easements, covering a total area of 65 ha, for infrastructure development and creation (motorways, express roads, a civil prison, power lines, railways) are accentuating the artificial nature of the park's environment and a retreat from its official administrative boundaries. Numerous human activities have led to pollution from solid and liquid waste and degradation of the park's dense forest.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The human, material and financial resources on the ground are largely insufficient for effective protection. These resources must be strengthened to protect the Banco NP from degradation. In order to preserve its function as a water reservoir, it is recommended that restoration work be undertaken to reforest the parts of the park that are currently subject to water erosion and degrading human activity. The development of tourism could be one of the ways of securing funding for the park. It is essential to set up a platform for consultation and management that brings together government players, environmental protection NGOs and local populations to ensure that the park's environment is properly protected and managed. The construction of a wall to demarcate the park will help stem incursions into the forest to establish plots or fields.





A group of chimpanzees in the Banco national park. (© OIPR)

Environmental education session at the Banco NP. (© OIPR)

CÔTE D'IVOIRE

CAVALLY NATURE RESERVE

Réserve naturelle du Cavally
Category IV, habitat or species management area
Creation date: 2023 (upgrading, classified forest since 1954)
Area: 665 km²

PA Manager: *Office Ivoirien des Parcs et Réserves* (OIPR)
No development and management plan
No IMET evaluation conducted

MAIN HABITATS: The vegetation of the Cavally Nature Reserve is made up of stands of Upper Guinean dense evergreen rainforest, with characteristic plant species such as Diospyros spp. (including *Diospyros mannii*, Ebenaceae) and rattan (*Eremospatha macrocarpa*, Arecaceae), but it has been very much opened up by years of logging for timber.

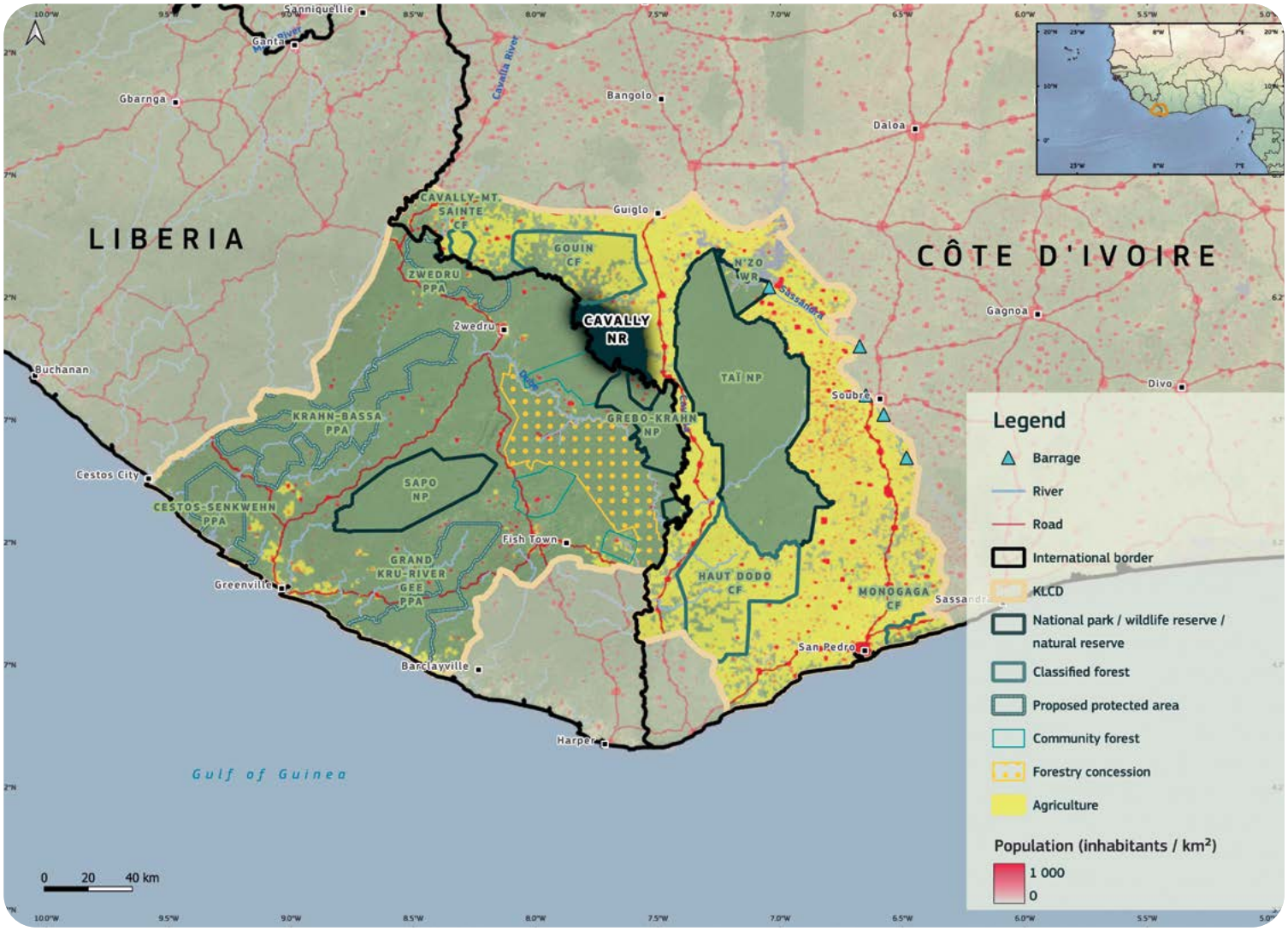
MAIN SPECIES (FAUNA, FLORA): Evidence of the presence of large mammals, such as forest buffalo (*Syncerus caffer nanus*), pygmy hippopotamus (*Choeropsis liberiensis*), bongo (*Tragelaphus eurycerus*), red river hog (Potamochoerus porcus), and Jentink's duiker (Cephalophus jentinki), is noted in the monitoring and assessment carried out by the Wild Chimpanzee Foundation (WCF), as well as certain tailed monkeys, e.g. western red colobus (*Piliocolobus badius*), sooty mangabey (*Cercocebus* atys), Diana monkey (*Cercopithecus diana*), putty-nosed monkey (*Cercopithecus* nictitans), and western chimpanzee (*Pan troglodytes verus*).

OTHER CONSERVATION VALUES: The preservation of the Cavally reserve is desired by many of the local village communities and their participation in its restoration is envisaged.

MAIN THREATS: Demographic and agricultural pressure is high, particularly due to the low conservation status of this classified forest, which was invaded by migrants between 2015 and 2019, albeit without the establishment of permanent habitats. Clearing was halted in 2019, leading to strong monitoring measures and the launch of a SODEFOR-Nestlé-Earthworm restoration project. However, despite this, the maintenance of existing cocoa plantations continued, with attempts at cocoa production being made illegally.

Gold panning is also present to the northwest of the reserve, near the classified Goin-Débé forest, and along the Cavally River.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Improving and maintaining connectivity within the TGKS complex is very important for the conservation of this landscape. After upgrading, monitoring is essential, as is restoring the vegetation by replanting native forest species and/or assisted natural regeneration in abandoned cocoa farms (after pruning if possible). Transboundary actions are envisaged with the FDA of Liberia, which manages the Grebo-Krahn NP, adjoining the reserve for a few kilometres along the Cavally River.



View of the forest canopy in Cavally Nature Reserve, Côte d'Ivoire. (© M.Languy)

The dense rainforest in Ankasa Wildlife Reserve, Ghana. (Guilhem Duvot/Shutterstock)

GHANA

ANKASA WILDLIFE RESERVE

Ankasa Wildlife Reserve
Category VI, protected area with sustainable use of natural resources
Creation date: 1976
Area: 374 km²

PA Manager: Wildlife Division (Forestry Commission)
Development and management plan expired (2000)

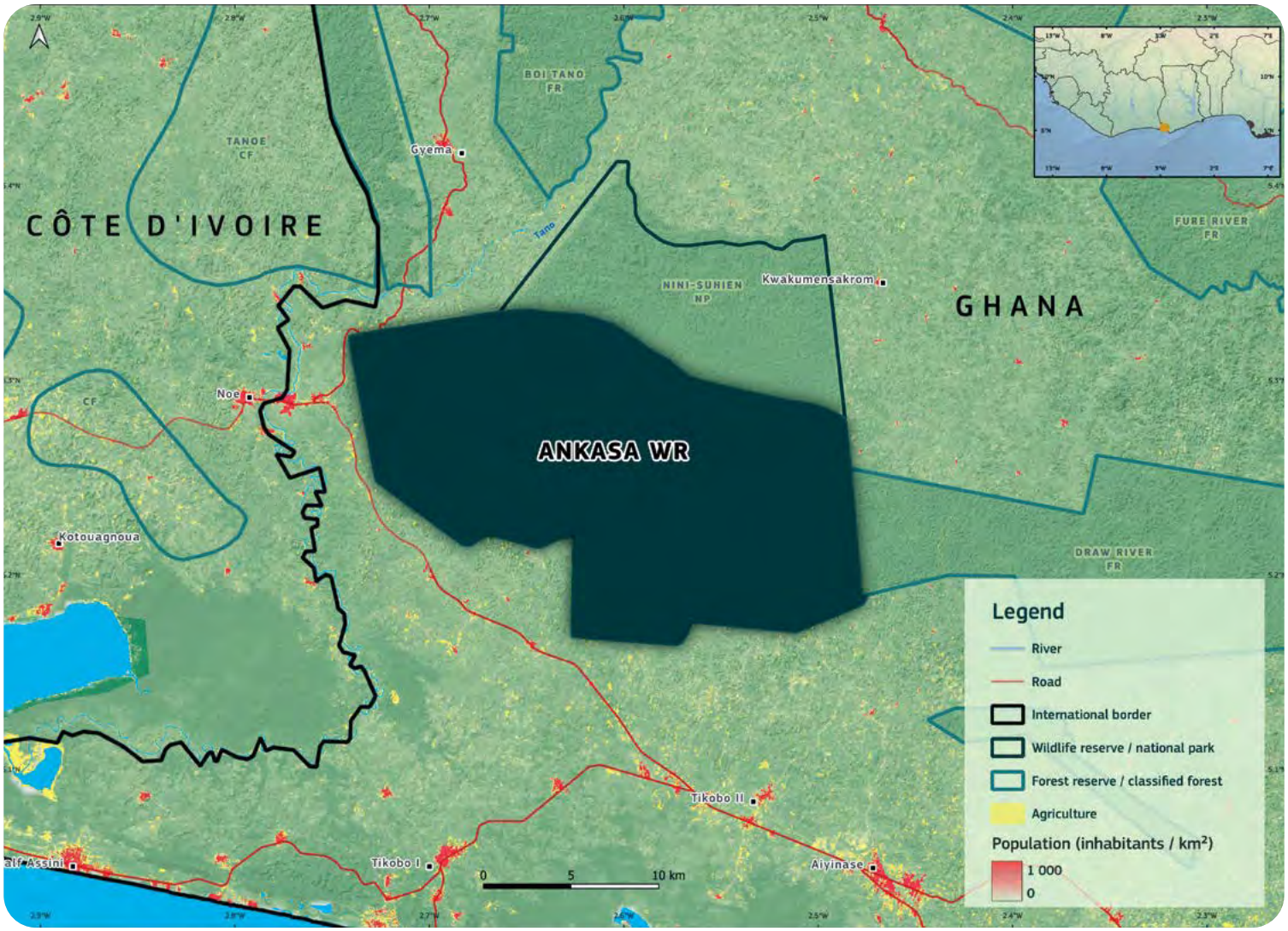
MAIN HABITATS: The Ankasa Wildlife Reserve is mainly made up of dense evergreen rainforest with dabema (*Piptadeniastrum africanum*, Fabaceae) and *Strombosia pustulata* (Strombosiaceae). Depending on the habitat, the characteristic species vary: *Strombosia pustalata*, *S. glaucescens* and *Dacryodes klaineana* (Burseraceae); *Picralima nitida* (Apocynaceae), *Funtumia elastica* (Apocynaceae), D. *klaineana* (Burseraceae) and *Tabernaemontana africana* (Apocynaceae); *Gluema ivorensis* (Sapotabceae), *Pentadesma butyracea* (Clusiaceae) and *Corynanthe pachyceras* (Rubiaceae).

MAIN SPECIES (FAUNA, FLORA): The Ankasa Wildlife Reserve is home to a particularly high density of rare species. The animal community includes forest elephant (*Loxodonta cyclotis*), bongo (*Tragelaphus euryceros*), leopard (*Panthera pardus*), giant ground pangolin (*Smutsia gigantea*), and African manatee (*Trichechus senegalensis*). As for primates, western chimpanzee (*Pan troglodytes verus*), Geoffroy's colobus (*Colobus vellerosus*), Roloway's monkey (*Cercopithecus Roloway*) and the critically endangered Miss Waldron's red colobus (*Piliocolobus waldroni*) can be found here, along with olive colobus (*Procolobus verus*) and white-naped mangabey (*Cercocebus lunulatus*). More than 350 species of birds have been counted, including grey parrot (*Psittacus erithacus*), white-breasted guineafowl (*Agelastes meleagrides*), rufous fishing owl (*Scotopelia ussheri*), and western wattled cuckooshrike (*Lobotos lobatus*, etc.). Amphibian species include *Phrynobatrachus intermedius*, restricted to Ankasa, and *Hyperolius bobirensis*, restricted to the Ankasa and Bobiri forests.

OTHER CONSERVATION VALUES: Recognised as an IBA, a KBA and an AZE site, the Ankasa Wildlife Reserve is considered to be Ghana's 'most special' forest. It is the only evergreen tropical rainforest in the country and is said to be the richest site in West Africa in terms of tree species.

MAIN THREATS: Hunting and the collection of NTFPs are practised in several areas of the reserve. Many years of hunting have had an impact on animal populations, which have declined.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: The development and management plan is now seriously out of date and needs revising. Current protection efforts are weak: the management team needs to be strengthened and re-motivated. A higher protection status (national park) would be one way of encouraging better protection.


CÔTE D'IVOIRE
GHANA
ANKASA WR
TANOE CF
BOI TANO FR
Gyema
Tano
NINI-SUHIEN NP
Kwakumensakrom
FURE RIVER FR
DRAW RIVER FR
Noe
CF
Kotouagnoua
Tikobo II
Tikobo I
Aiyinase
0
5
10 km
Legend
River
Road
International border
Wildlife reserve / national park
Forest reserve / classified forest
Agriculture
Population (inhabitants / km²)
1 000
0

Footbridge in the canopy of Kakum National Park, Ghana. (Elena Ska/Shutterstock)

GHANA

KAKUM NATIONAL PARK

Kakum National Park
Category II, national park
Creation date: 1992
Area: 210 km²

PA Manager: Wildlife Division (Forestry Commission)
Development and management plan expired (1996-2006)

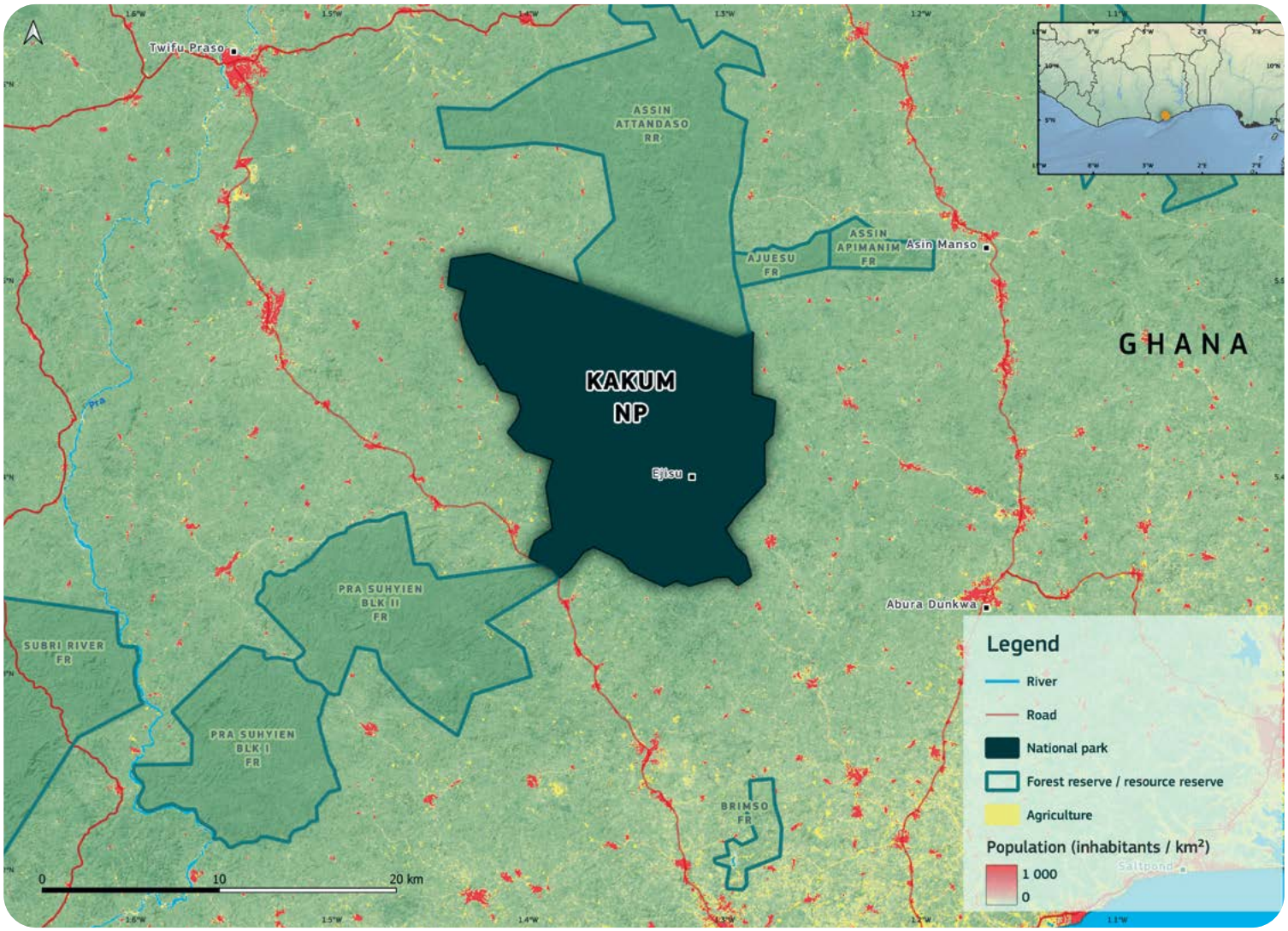
MAIN HABITATS: The dominant vegetation in Kakum National Park is dense evergreen tropical rainforest. Areas of seasonally dry and semi-deciduous forest are also present. Other vegetal formations found in the park include swamps, gallery forests along the waterways, and specific formations of plant communities on shallow granite soils (boval vegetation). Secondary forests resulting from past logging are also present. The altitude of the park varies between 135 and 250 m, with a predominantly flat relief dotted with a few hills in the southwestern zone.

MAIN SPECIES (FAUNA, FLORA): Kakum NP is home to the highest density of forest elephant (*Loxodonta cyclotis*) in Ghana. Other rare or threatened species also inhabit the park: bongo (*Tragelaphus eurycerus*), olive colobus (*Procolobus verus*), Geoffroy's colobus (*Colobus vellerosus*) and yellow-backed duiker (*Cephalophus sylvicultor*). The roloway monkey (*Cercopithecus roloway*), which is thought to be extinct, may also be present. The avifauna is rich, with more than 360 species present in the park, including white-breasted guineafowl (*Agelastes meleagrides*), grey parrot (*Psittacus erithacus*), yellow-casqued wattled hornbill (*Ceratogymna elata*), brown-cheeked hornbill (*Bycanistes cylindricus*), and yellow-footed honeyguide (*Melignomon eisentrauti*).

OTHER CONSERVATION VALUES: Kakum NP is an IBA and is registered for recognition as a UNESCO WHS. The Kakum River, from which the park takes its name, and its tributaries are the source of freshwater for the city of Cape Coast and 133 surrounding towns and villages. Kakum is also the first national park in Ghana to have been created by a local initiative rather than by the state wildlife management agency.

MAIN THREATS: In Ghana, Kakum is considered to be the best-protected forest site. Despite this, the main threat to the national park's ecosystem is hunting and poaching. The development of tourism and the sharing of the resulting benefits with the local population could help reduce this threat. A large part of the site was subject to selective logging between 1975 and 1989.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: Conservation of Kakum NP could be improved by involving local people more closely in environmental education activities and by establishing genuine cooperation between the various stakeholders.


Twifu Praso
ASSIN ATTANDASO RR
ASSIN APIMANIM FR
AJUESU FR
Asin Manso
GHANA
KAKUM NP
Ejisu
PRA SUHYIEN BLK II FR
SUBRI RIVER FR
PRA SUHYIEN BLK I FR
BRIMSO FR
Abura Dunkwa
Saltpond
Legend
River
Road
National park
Forest reserve / resource reserve
Agriculture
Population (inhabitants / km²)
1 000
0
0
10
20 km

GUINEA

DIÉCKÉ CLASSIFIED FOREST

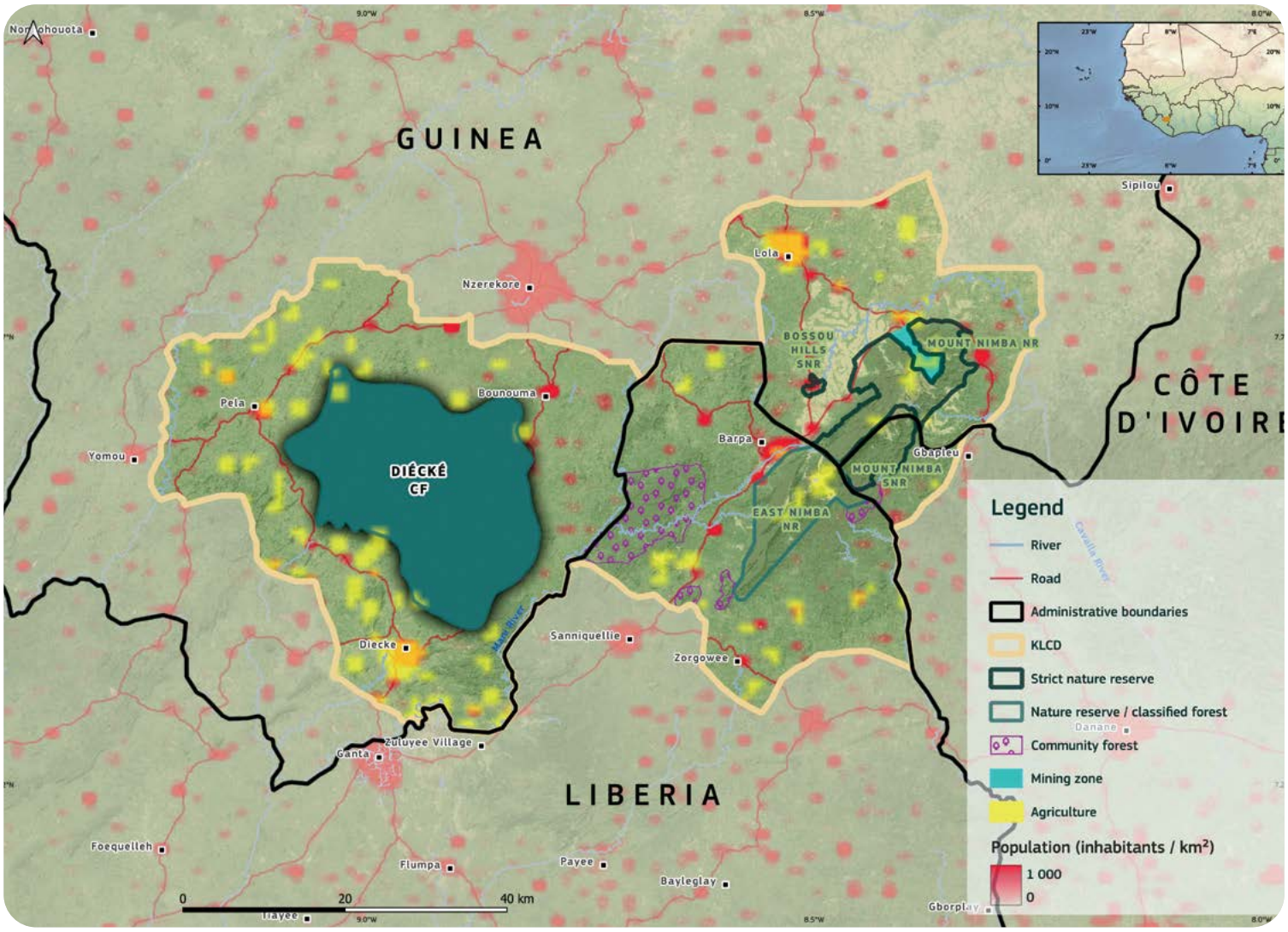
Forêt classée de Diécké
Not currently recognised by the IUCN
Creation date: 1945
Area: 640 km²

PA Manager: *Centre forestier de Nzérékoré*
Development and management plan available (2021-2030)
Latest IMET score: index 37.8

Contexte de gestion	Planification	Intrants	Processus	Resultats	Effects et Impacts	IMET index
68.3	53.6	13.1	12.5	15.28	54.1	36.15

MAIN HABITATS: Most of the Diécké Classified Forest (around 70 %) is made up of dense mature and secondary rainforests. More open forests, non-forested areas and fallow land cover the remainder. The semi-deciduous forests of the lower storey contain ayous (*Triplochiton scleroxylon*, Malvaceae), fraké (*Terminalia superba*, Combretaceae), framiré (*Terminalia ivorensis*, Combretaceae) and essang (*Parkia bicolor*, Fabaceae), while the evergreen rainforests of the valleys and slopes are made up of azobe (*Lophira alata*, Ochnaceae), niangon (*Heritiera utilis*, Malvaceae) and mahogany (*Khaya ivorensis*, Meliaceae). In the montane storey, the characteristic species are Guinea plum (*Parinari excelsa*, Chrysobalanaceae), dragon tree (*Dracaena arborea*, Asparagaceae) and makoré (*Tieghemella heckelii*, Sapotaceae). The forest is found at altitudes of 400 to 595 m.

MAIN SPECIES (FAUNA, FLORA): Diécké has a high level of species richness, with 62 species of conservation importance, including: two reptile species, one of which is the dwarf crocodile (*Osteolaemus tetraspis*); 14 amphibian species; eight bird species, in particular Ballmann's malimbe (*Malimbus ballmanni*), yellow-headed picathartes (*Picathartes gymnocephalus*), and green-tailed bristlebill (*Bleda eximius*); seven threatened species of large mammals, including the second largest national population of pygmy hippopotamus (*Choeropsis liberiensis*); Jentink's duiker (*Cephalophus jentinki*); and three species of primate, including western chimpanzee (*Pan troglodytes verus*) and Diana monkey (Cercopithecus diana). In terms of vegetation, the *Cola attiensis* (Malvaceae), in danger of extinction, is present in Diécké.



OTHER CONSERVATION VALUES: The Diécké Classified Forest is one of the pilot sites for the implementation of the 2020-2030 national plan for the conservation of Guinean chimpanzees. It is also an IBA and lies in a wildlife migration corridor between Liberia and Guinea. In terms of importance and priority for biodiversity conservation in Guinea, it ranks just after the Ziama Biosphere Reserve, but unlike Ziama, given Diécké's large surface area and compact shape, it is a resilient lowland forest massif.

MAIN THREATS: The traditional extraction of forest resources (animal species and other NTFPs) is a widely practised activity in the Diécké Classified Forest. Poaching is the main threat to the conservation of this forest ecosystem, particularly by foreign hunters who come to hunt game and supply the major towns. Non-timber forest products that are frequently collected include rattan and raffia wine.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: A number of actions need to be taken to improve the protection of the Diécké Classified Forest. It is essential to step up patrols to combat illegal activities by organising more in-depth missions inside the forest rather than limiting them to its periphery. In addition, there is a need to increase and secure funding, to restore cleared or degraded areas, and to develop income-generating activities, particularly tourism, while ensuring that revenues are shared equitably with the local population. Listing Diécké as a UNESCO biosphere reserve would provide greater recognition of its conservation status. Also, upgrading the status of the protected area to that of a national park would guarantee greater legal protection for the forest.

*A female yellow-casqued hornbill (*Ceratogymna elata*). (© M. Languy)*

NIGERIA

OKOMU NATIONAL PARK

Okomu National Park
Category II, national park
Creation date: 1988
Area: 124 km²

PA Manager: Nigerian National Park Service (NNPS)

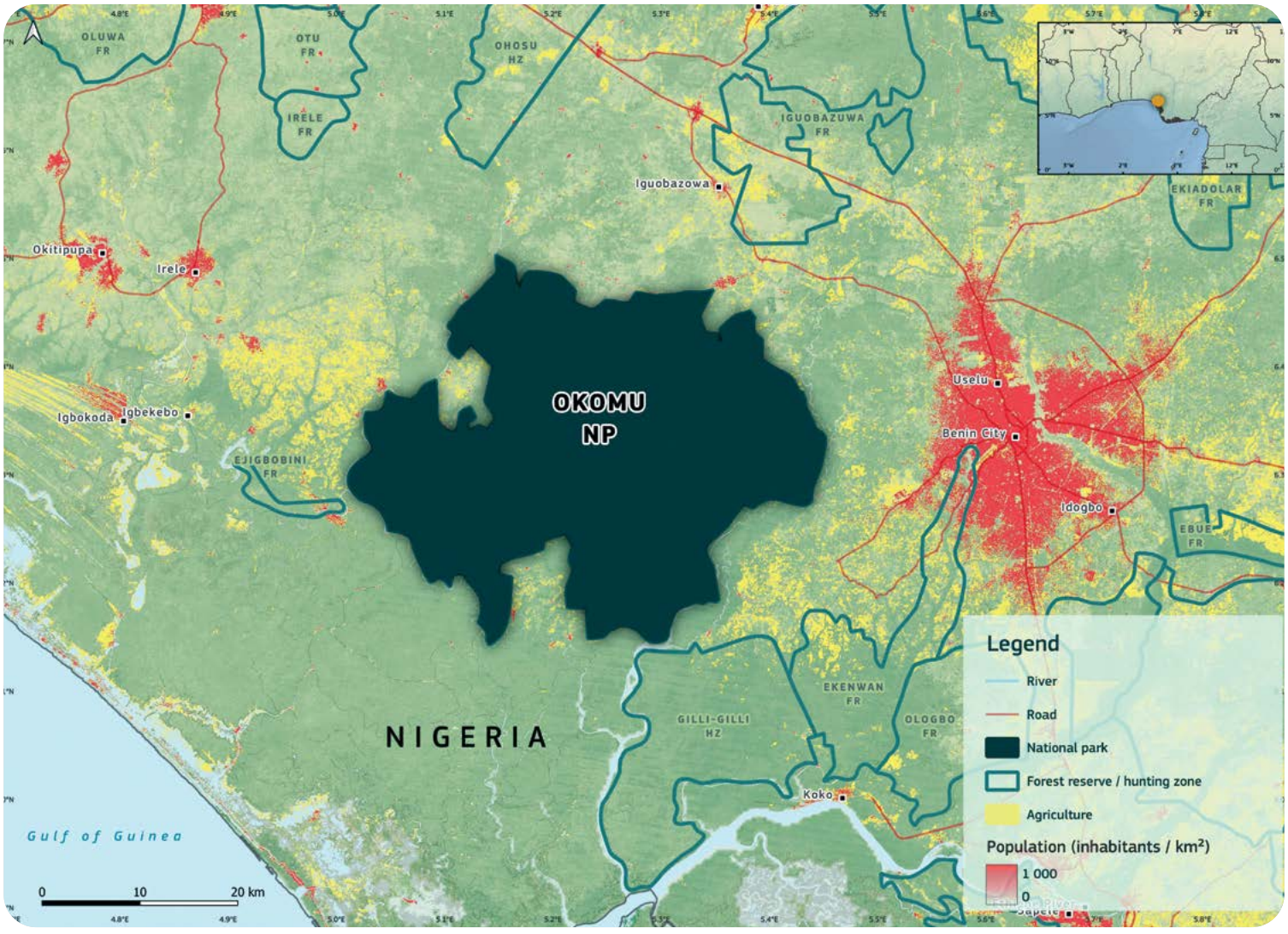
MAIN HABITATS: Okumu National Park is a mosaic of Guinean-Congolese dense lowland rainforests, swamp forests, secondary forests and open scrubland. The characteristic tree species found here are fromager (*Ceiba pentandra*, Malvaceae), ohia (*Celtis zenkeri*, Ulmaceae), ayous (*Triplochiton scleroxylon*, Malvaceae), ako (*Antiaris toxicaria var. africana*, Moraceae), ilomba (*Pycnanthus angolensis*, Myristicaceae) and emien (*Alstonia congensis*, Apocynaceae). The natural forest is still present in Okumu NP, in a limited area to the south of the park and in a marshy area near the Osse and Siluko rivers.

MAIN SPECIES (FAUNA, FLORA): The Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*) is present in Okomu NP. The red-bellied monkey (*Cercopithecus erythrogaster pococki*, currently the largest population in Okumu), red-capped mangabey (*Cercocebus torquatus*), and forest elephant (*Loxodonta cyclotis*) are other endangered species present in Okumu. Forest buffalo (*Syncerus caffer nanus*) is also present, as are almost 150 bird species, including a large group of hornbills, with nine different species, including the yellow-casqued wattled hornbill (*Ceratogymna elata*).

OTHER CONSERVATION VALUES: The Okomu NP and forest reserve is one of the top priority sites for chimpanzee conservation, and the national park is recognised as an IBA.

MAIN THREATS: A large part of the reserve has been converted into oil palm or rubber plantations, and fields of cassava or other crops. In Okumu NP, protection against logging and farming is effective; however, anti-poaching measures are not and these need to be strengthened.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: In 2011, recommendations included expanding the park's periphery and halting all forest conversion, thus strengthening collaboration with commercial agricultural production companies, building the capacity of park officers in law enforcement and wildlife monitoring, developing research activities, in particular by setting up a research station, and raising awareness of environmental issues through dedicated programmes in agricultural companies and schools.


OLUWA FR
OTU FR
OHOSU HZ
IRELE FR
IGUOBAZUWA FR
Iguobazowa
EKIADOLAR FR
Okitipupa
Irele
OKOMU NP
Igbokoda
Igbekebo
EJIGBOBINI FR
Uselu
Benin City
Idogbo
EBUE FR
EKENWAN FR
GILLI-GILLI HZ
OLOGBO FR
NIGERIA
Koko
Gulf of Guinea
0
10
20 km
Legend
River
Road
National park
Forest reserve / hunting zone
Agriculture
Population (inhabitants / km²)
1 000
0

The Tacugama chimpanzee sanctuary is located in the Western Area Peninsula National Park. (Wolfgang Kaehler / Alamy Stock Photo)

SIERRA LEONE

WESTERN AREA PENINSULA NATIONAL PARK

Western Area Peninsula National Park
Category II, national park
Creation date: 1916
Area: 177 km²

PA Manager: National Protected Area Authority (NPAA)

MAIN HABITATS: Situated on the coast of Sierra Leone, the Western Area Peninsula National Park combines forested, mountainous landscapes with coastal seascapes and beaches. It is made up of mature Guinean-Congolese dense rainforest of the evergreen hygrophilous coastal type. A number of hills form a chain of relief, culminating at an altitude of 971 m. Their rocky, drier slopes are covered with low shrub forest, as are the summits. Lateritic areas are characterised by grassy meadows.

MAIN SPECIES (FAUNA, FLORA): The Western Area Peninsula NP is a veritable reservoir of biodiversity. It is home to several species that are rare or considered threatened by the IUCN: western chimpanzee (*Pan troglodytes verus*), sooty mangabey (*Cercocebus atys*), western red colobus (*Piliocolobus badius*), king colobus (*Colobus polykomos*), Diana monkey (*Cercopithecus diana*), Jentink's duiker (*Cephalophus jentinki*), bay duiker (*Cephalophus dorsalis*), Maxwell's duiker (*Cephalophus maxwelli*) and leopard (*Panthera pardus*). The avian fauna is also remarkable, with at least 316 species, including brown-cheeked hornbill (*Bycanistes cylindricus*), green-tailed bristlebill (*Bleda eximius*) and yellow-headed picathartes (*Picathartes gymnocephalus*). At least one species of endemic toad is present (*Arthroleptis aureoli*).

OTHER CONSERVATION VALUES: In addition to the scenic nature of the park, which combines forests, mountains and ocean, the area also has a strong historical and cultural significance as a settlement for freed slaves. It also has the drinking water reservoir for the country's capital, Freetown.

MAIN THREATS: Although the Western Area Peninsula NP has long been a wildlife reserve where hunting is prohibited, evidence of hunting is abundant and can be seen throughout the park. Various activities that lead to degradation or deforestation are also practised here: timber harvesting for construction, charcoal production, agriculture and even house building. Some farming practices also have an impact on water quality, linked to the use of chemicals. There is little law enforcement in the park, despite its high legal protection status.

RECOMMENDATIONS AND INTERVENTION PRIORITIES, 2025-2030: It is important to step up surveillance and enforcement activities to improve protection of the Western Area Peninsula NP. In order to monitor the effectiveness of management measures it is also important to carry out regular inventories to track animal populations and indicators of human activity. In order to improve the local communities' standard of living and reduce their negative impact on the ecosystem, the development of ecotourism and income-generating activities based on the sustainable use of forest resources must be strengthened.


SIERRA LEONE RIVER ESTUARY MPA
Freetown
SIERRA LEONE
WESTERN AREA PENINSULA NP
Waterloo
Atlantic Ocean
YAWRI BAY MPA
Legend
River
Road
National park / marine protected area
Agriculture
Population (inhabitants / km²)
1 000
0
0
10
20 km

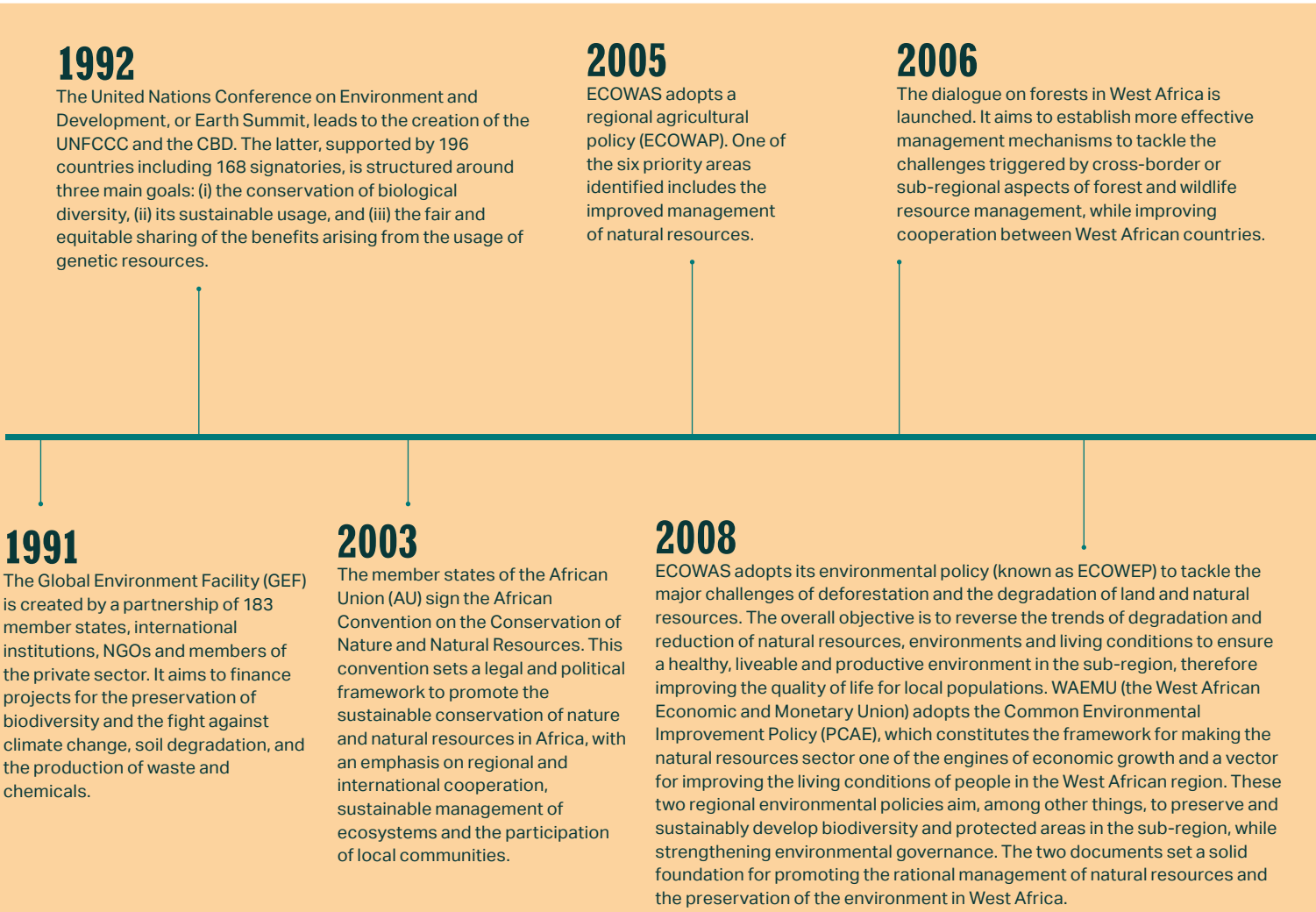
4

THE MAJOR POLICIES GOVERNING FOREST MANAGEMENT: FROM GLOBAL TO LOCAL

4

THE MAJOR POLICIES GOVERNING FOREST MANAGEMENT: FROM GLOBAL TO LOCAL

FIGURE 23 Sustainable forest management in West Africa: from its origins to the current situation



Global awareness of the role of forests and the importance of biodiversity has led to various multilateral environmental agreements (MEAs) to ensure the preservation of ecosystems. Legal instruments such as the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) have laid the foundations for protecting biodiversity, while the Sustainable Development Goals (SDG), the Aichi Biodiversity Targets and the Paris Agreement on climate change have consolidated global aspirations for a sustainable future.

Africa's forests are not only perceived as biodiversity reservoirs, but also as key drivers of sustainable socioeconomic development. This understanding is leading to a deeper integration of conservation objectives within development policies, establishing a balance between economic growth and the preservation of forest ecosystems.

The effective implementation of commitments at the international and regional levels involves a range of scales, from global to local, and is aligned with a holistic vision of development, which integrates environmental health as a foundation for sustainable progress.

2013

The dialogue on forests (launched in 2006) leads to the Convergence Plan for the Sustainable Management and Conservation of Forest Ecosystems in West Africa 2013-2023, commonly known as the Forest Convergence Plan (PCF). This plan serves as a reference framework for federating national and sub-regional actions, in order to achieve the sustainable management of forests and wildlife and the enhancement of forest ecosystems in the sub-region. The objective of the PCF is to ensure that 'West African countries manage the forest and wildlife resources of the sub-region in a sustainable and concerted manner for the wellbeing of the people and the protection of the environment by 2025'[a].

2015

The Paris Agreement on climate change, which aims to limit the increase in global average temperature to 1.5 °C above pre-industrial levels, is adopted by 196 parties.

2016

The WAEMU Commission has adopted the Regional Support Programme for the Integrated Management of Transboundary Ecosystems (PAGIET). Its aim is to help improve integrated management practices for transboundary ecosystems in West Africa. More specifically, it aims to strengthen the effectiveness of regional governance frameworks and mechanisms for the preservation and sustainable development of transboundary ecosystems.

2020

The AU adopts the sustainable forest management framework (SFMF) 2020-2030. This initiative demonstrates the collective commitment of African nations to preserving forests and promoting the responsible management of natural resources.

2022

ECOWAS adopts 'Vision 2050: ECOWAS of the Peoples: Peace and prosperity for all'. This vision is based on a number of cross-cutting themes, including gender, youth and employment, digitalisation, climate change, resilience and capacity building. The same year, ECOWAS adopts its first regional climate strategy, with the aim of strengthening cooperation between ECOWAS member states on policies to adapt to the existing effects of climate change, and to establish development pathways with low greenhouse gas emissions. This is a realisation of the Paris Climate Agreement, signed in 2015, to which all ECOWAS member states are parties.

2024

The ministers and authorities in charge of the environment in West African States approve the Regional Strategy for the management of protected and conserved areas in West Africa up to 2050. Linked to and supported by the post-2020 Global Biodiversity Framework (Kunming-Montreal Agreement) and the Kigali Call to Action, the vision of this strategy is: 'By 2050, biodiversity and protected and conserved areas (PCAs) in West Africa are managed sustainably and contribute significantly to socioeconomic development and to improving the well-being and resilience of populations.'

a *https://papfor.org/IMG/pdf/cedeao_plan_de_convergence_forestier_en_afrique_de_l_ouest.pdf, page 8.*

Cross River National Park has been identified as a biodiversity hotspot and is the largest area of tropical forest in Nigeria. (© WCS).

These global commitments have found significant resonance on the African continent, with the creation of the SFMF 2020-2030 by the African Union. This initiative demonstrates the collective commitment of African nations to conserving forests and promoting the responsible management of natural resources.

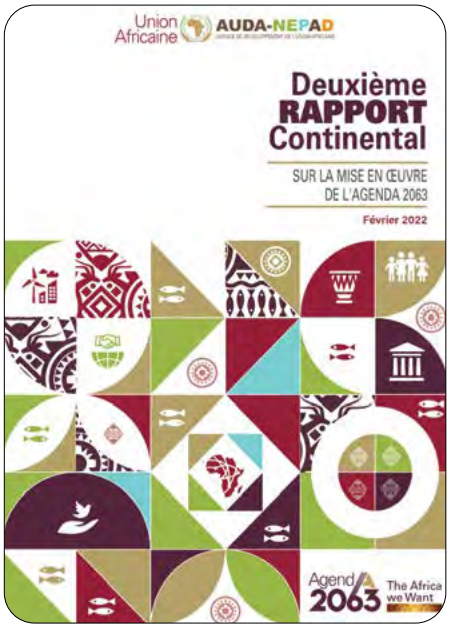
At the regional level, a clear example of this harmonised commitment is ECOWAS' Forest Convergence Plan, as well as the Convergence Plan for the conservation and sustainable management of Central African forest ecosystems of the Central African Forest Commission (COMIFAC). These regional plans provide a framework for concerted action by member countries to ensure the sustainability of forests, while taking local characteristics into account.

This global and regional harmonisation must then be translated into concrete actions through specific action plans. One significant example is the protection of emblematic species such as chimpanzees, for whom dedicated initiatives are being implemented to ensure their survival and preserve their habitats. Likewise, the sustainable management of crucial ecosystems (such as wetlands) is promoted through targeted action plans, ensuring the protection of these unique habitats and the conservation of the species that depend on them.

4.1 AFRICAN FOREST MANAGEMENT POLICIES

Africa's forests cover more than 624 million hectares, or 20.6 % of the continent's surface, and represent 15.6 % of global forest cover. At the regional and global scales, they are crucial for maintaining environmental quality and stability. These forests also play a vital role in supporting agriculture, providing ecosystem services such as pollination, soil stabilisation, water retention and climate regulation, which are fundamental to sustainable agriculture. All of these ecosystem services provided by Africa's forests make them essential to the achievement of the SDGs and the global objectives of the United Nations Forum on Forests, as well as other international and regional forest strategies and instruments. In addition, Africa's forests play a key role in the aspirations of Agenda 2063: The Africa We Want, which foresees a prosperous continent with the tools needed to guide its own development through long-term and sustainable management of its forest resources.

Despite the importance of Africa's forests, the forest sector is faced with poor land use and forest management policies, unsustainable practices, and competition for land with agriculture, mining, livestock, energy and infrastructure. Lastly, the forest sector is rarely a priority in national resource allocation plans.



The second continental report on the implementation of the African Union Agenda 2063 (2022)

In response to these challenges, the member states of the AU have recognised the importance of forests in mitigating climate change and adapting to its effects. Conventions and frameworks, such as the Maputo Convention on nature and natural resources signed in 2003, and the African Union Convention on cross-border cooperation (Niamey Convention) signed in 2014, have been implemented to harmonise approaches and combine efforts.

4.1.1 THE AFRICAN UNION'S AGENDA 2063

Agenda 2063 is an initiative of the AU to provide a roadmap for Africa's sustainable development and transformation over a 50-year period. Covering the years 2013 to 2063, it was adopted in 2013 by the AU heads of state.

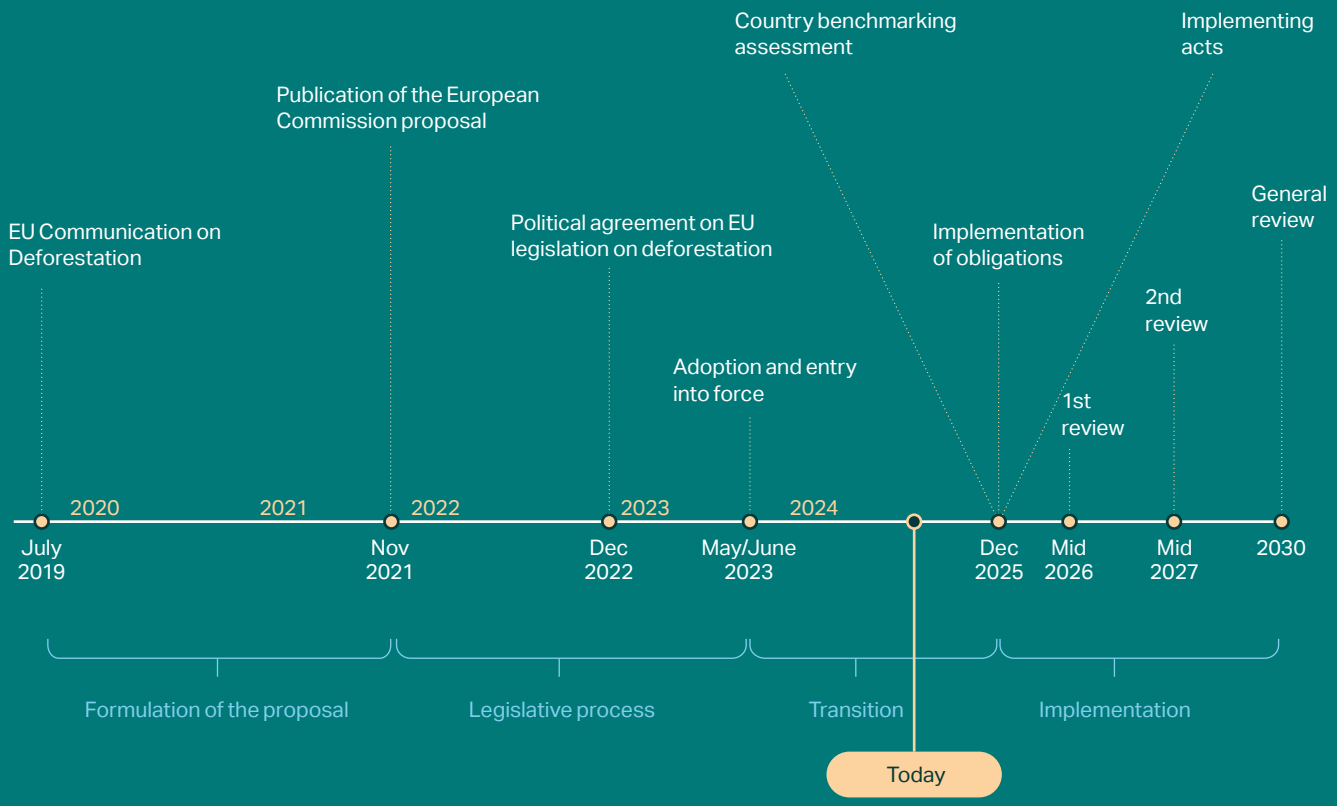
Agenda 2063 aims to stimulate the economic, social and political development of the African continent. It seeks to build an integrated, prosperous and peaceful Africa based on inclusive economic growth and sustainable development. The key aspirations of Agenda 2063 include eradicating poverty, promoting social inclusion, establishing strong institutions, achieving sustainable economic growth, and strengthening Africa's role on the world stage.

Agenda 2063 includes a series of effective projects and initiatives aimed at achieving these objectives, covering areas such as education, health, infrastructure, industrialisation, governance and peace. It also focuses on promoting unity and regional integration on the continent. This ambitious agenda reflects the collective vision of African countries for the future of their continent and seeks to mobilise the resources and efforts needed to achieve the targets set by 2063.

4.1.2 AFRICAN CONVENTION ON THE CONSERVATION OF NATURE AND NATURAL RESOURCES

Signed in 2003 by the member states of the African Union, this convention provides a legal and political framework to promote the sustainable conservation of nature and natural resources in Africa, with an emphasis on regional and international cooperation, sustainable ecosystem management, and the participation of local communities.

FIGURE 24 Timeline of the process for formulating and implementing European legislation on imported deforestation (adapted from Donteville A., 2023).



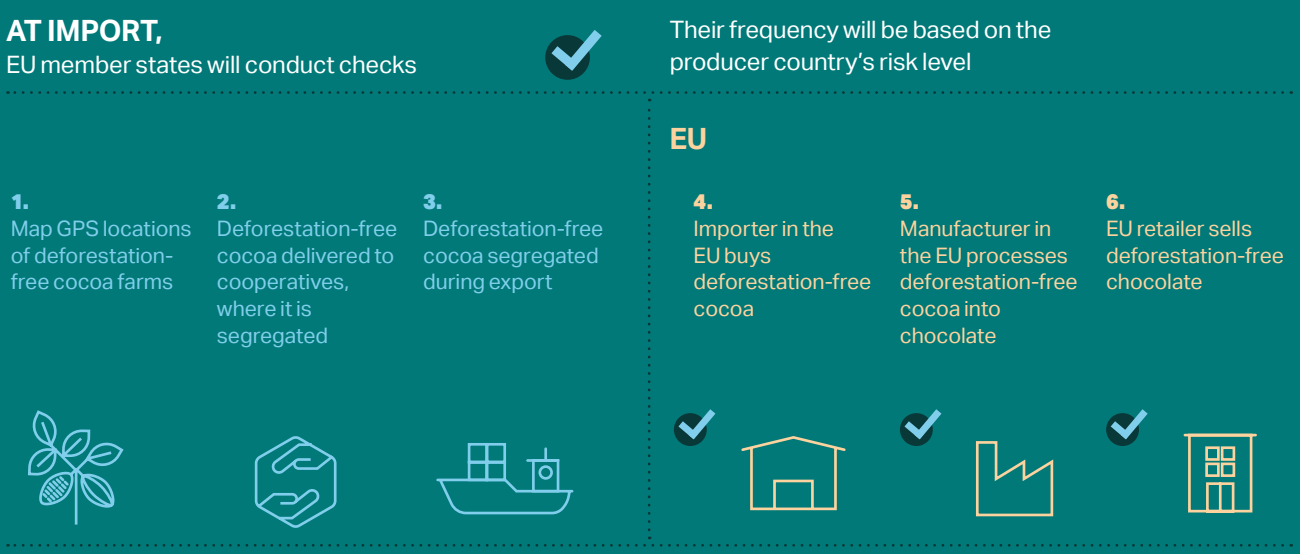
SIDEBAR 19 IN EUROPE: THE BATTLE AGAINST IMPORTED DEFORESTATION

At the beginning of 2021, as part of the battle against climate change and biodiversity loss, the European Parliament launched a strategy to fight imported deforestation, in this case the deforestation happening outside Europe's borders for the production of commodities sold and consumed in Europe. This decision was prompted by the realisation that, although the trend within Europe is towards an increase in forest areas, consumption in the European Union is responsible for around 10 % of global deforestation between 1990 and 2020.

Since the regulation came into force in June 2023, European companies are obliged to provide a declaration (due diligence) attesting that a product does not come from deforested land and has not caused forest degradation if they want to be able to import this product into Europe. This regulation applies to beef, cocoa, coffee, palm oil, soya, wood (including charcoal), rubber, and all products containing, made from, or fed with these commodities. It therefore aims to ensure that only legal and 'zero deforestation' (deforestation-free) products move around in the European market. Deforestation-free goods are those produced on land that has not been deforested or degraded after 31 December 2020, which somewhat limits the scope of this legislation.

FIGURE 25 Representation of the traceability process for deforestation-free products. (Adapted from Donteville A., 2023.)

SUMMARY: TRACEABILITY OF THE COCOA SUPPLY CHAIN

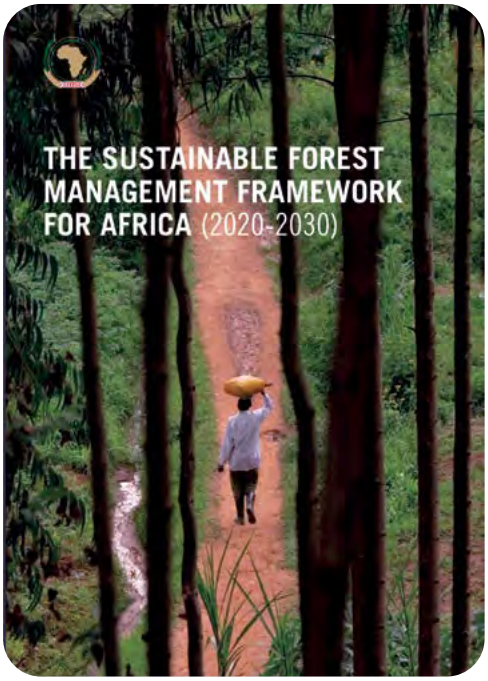


To facilitate procedures, countries have been classified according to their level of risk, and the level assigned determines the procedure to be followed and the level of control. Controls are based in particular on the precise geolocation of farms and plantations, which can then be monitored by remote detection.

Simultaneously, the European Commission made a commitment to support partner countries in adopting these new rules, and to help them manage, protect and restore forests by strengthening forest governance and technical capabilities, as well as developing appropriate legislative instruments.

These initiatives are part of a global action plan launched in 2019, which aims to strengthen EU action to protect and restore forests and biodiversity.

Link to the regulation:
https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1687867231461&uri=CELEX%3A32023R1115



→
The Sustainable Forest Management Framework for Africa (2020-2030)

The convention focuses on key areas such as water, vegetation cover, species and genetic diversity, protected species, and the trade of species and their products. It advocates a holistic approach by integrating elements such as land-use plans, national or local development plans, sustainable agricultural and forestry practices, and specific pollution control and mitigation/rehabilitation measures. It also encourages the creation of conservation areas and the adoption of practices that preserve natural heritage while promoting sustainable development.

The convention binds states to regularly monitor and evaluate processes and activities affecting the environment and natural resources, thereby establishing a robust framework for assessing progress in implementing commitments. It also seeks to integrate nature conservation into overall development, underlining the importance of balancing human needs with ecosystem preservation. The convention also aims to harmonise national legislation on the regulation of forests, the management rules of fauna and flora, and a systemic approach integrating water, agriculture, fishing and pastoral resources.

4.1.3 THE AU'S SUSTAINABLE FOREST MANAGEMENT FRAMEWORK FOR AFRICA (2020-2030)

The African Union's SFMF (2020-2030) was developed in collaboration with the active participation of member states and regional economic communities. It underlines the importance of common policies for the management of forest resources where there are cross-border challenges.

This framework aims to promote sustainable forest management in order to overcome existing challenges, stimulate trade, strengthen livelihoods and increase rural incomes. It also provides guidance for investments and partnerships in the forest sector, creating a suitable environment for collaboration and policy harmonisation between the regional economic communities and the AU Commission.

In addition, it serves as a basis for monitoring, preparing reports and strengthening efforts to eliminate deforestation and forest degradation by 2063. In that respect, the vision of the SFMF is 'Africa will have achieved the target for zero deforestation and forest degradation. Its forests will be protected, managed in a sustainable manner, and restored through collaborative, cross-sectoral, and transformative initiatives. These efforts will aim to ensure

Coffee seedling nursery in the PAPFor landscape of Wologizi - Wonegizi - Ziama. (© M. Languy)

prosperity, food security, and resilience for the people of Africa.'

During the participatory development of the SFMF, major concerns were identified in several areas. At policy level, some of the aspects highlighted are as follows:

- Insufficient collaboration and integration of sustainable practices in other economic and production sectors (e.g. agriculture), jeopardising the health and integrity of forest resources;
- Limited integration of multilateral environmental agreements, decisions and other instruments on sustainable forest management into national plans and programmes;
- Lack of policy convergence, leading to duplication;
- Undefined policy frameworks to share responsibilities at the national and regional level for formulated environmental strategies;

These concerns have been incorporated into the 2020-2030 SFMF, which is structured around five priorities aimed at the sustainability of the resource.

4.2 REGIONAL FOREST MANAGEMENT POLICIES IN WEST AFRICA

Regional forest management policies in West Africa address challenges that cross borders, such as species displacement, forest fires and anthropic pressures. These regional policies enable a more effective approach to preserving forest ecosystems shared by several countries, as they aim to harmonise conservation efforts, promote a sustainable use of shared forest resources, and resolve cross-border challenges linked to deforestation, biodiversity and climate change.

Regional policies encourage cooperation between states for integrated and effective forest management. This involves agreements on the management of transboundary resources, the prevention of illegal timber trade, the fight against environmental crime and the coordination of monitoring activities.

There are two main regional economic and political institutions in West Africa:

- ECOWAS, which comprises 15 Member States (Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia,

Landscape of the Soyah Classified Forest in Guinea. (© M. Languy)

Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo);
- WAEMU, which comprises eight Member States (Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo).

At the regional level, the ECOWAS environmental policy and the WAEMU common environmental improvement policy are the frames of reference for promoting harmonised and rational management of natural resources and environmental conservation at the regional scale.

To these can be added specialised sub-regional organisations, such as the management bodies for shared freshwater resource basins that interact with forest resources, including gallery forests and mangroves, and in particular the Mano River Union (Sierra Leone, Guinea, Liberia and Côte d'Ivoire).

Most ECOWAS and WAEMU Member States are parties to international conventions, accords, and treaties. The two intergovernmental organisations themselves have observer status at the Conferences of the Parties (COP) to some of these conventions, in particular the CBD.

In addition, the sub-region has a number of other joint sub-regional initiatives which have been implemented as part of the follow-up to the commitments of the MEAs, including: the sub-regional action programme to combat desertification in West Africa (SRAP-WA), the Great Green Wall initiative, numerous watershed and river basin programmes, and programmes to support the implementation of the CBD, the UNFCCC, the United Nations Convention to Combat Desertification (UNCCD), and other conventions.

4.2.1 ECOWAS ENVIRONMENTAL POLICY (ECOWEP)

Adopted by Additional Act A/SA.4/12/08 of 19 December 2008 by the 35th Ordinary Session of the Assembly of Heads of State and Government held in Abuja (Nigeria), the ECOWAS Environmental Policy is in line with the institution's vision of 'a peaceful, dignified and prosperous West Africa whose diverse and productive natural resources are conserved, strengthened and sustainably managed for the development and balance of the sub-regional area'.
Like other ECOWAS regional sectoral policies, the Environmental Policy aims to contribute to resolving the major problems of deforestation and the degradation of land and natural resources,

By highlighting regional integration and the strategic role of natural resources in the economic development of the sub-region, the overall objective of the common environmental policy of ECOWAS states is to reverse the trends of degradation and reduction of natural resources, environments and the living environment, with a view to ensuring a healthy, liveable and productive environment in the sub-region, thereby improving the living conditions of local populations.

Taking into account, among other things, the cross-cutting nature of environmental issues in the sub-region, the shared and cross-border nature of natural resources, processes and related problems, as well as the mobilisation of adequate financial resources to effectively carry out interventions in the field of the environment in West Africa, the policy aims to reverse the degradation of natural resources, improve the quality of living environments and environments, and conserve biological diversity, with a view to ensuring a healthy and productive environment, by improving the balance of ecosystems and the well-being of populations.

To achieve these objectives, the ECOWAS environmental policy is implemented along 4 strategic lines, the first 2 of which, in relation to the sustainable management of West Africa's dense rainforests and protected forest areas, concern respectively (i) the promotion of environmental governance (establishment of a sub-regional mechanism) and capacity building to this end, and (ii) the promotion of sustainable resource management to improve the sub-regional economy while respecting the environment.

4.2.2 ECOWAS VISION 2050: 'ECOWAS OF THE PEOPLES: PEACE AND PROSPERITY FOR ALL'

The dramatic decline in forest cover in West Africa has prompted 15 ECOWAS member states to collaborate to

protect and manage the region's forests and wildlife. ECOWAS is therefore a key player in the development and implementation of regional forest management policies. It facilitates collaboration between member states to harmonise regulations, share best practice and coordinate actions.

ECOWAS was created in 1975 by the Treaty of Lagos[15] with the aim of *'promoting cooperation and integration with a view to establishing a West African economic union to raise the living standard of its peoples, maintain and increase economic stability, strengthen relations between member states, and contribute to the progress and development of the African continent'*.

In 2007, it adopted for the first time a 10-year vision, Vision 2020[16], which involved 'moving from an ECOWAS of states to an ECOWAS of peoples', with the ambition of 'becoming a borderless, peaceful, prosperous, and cohesive region, built on good governance and where people have the ability to access and exploit the enormous resources by creating opportunities for sustainable development and environmental conservation'. This vision is based on five pillars: (i) peace and security, (ii) good governance, (iii) showcase of the region's resources, (iv) economic and monetary integration, and (v) promotion of the private sector.

Following a participatory evaluation of the 2020 Vision, ECOWAS adopted in 2022 the '2050 Vision: ECOWAS of the Peoples: Peace and prosperity for all'. The vision clearly defines the objectives and strategic orientations that should guide the implementation of the medium-term strategic framework and action plans. Like the previous vision, it has five pillars, but with some modifications: (i) peace, security and stability, (ii) governance and the rule of law, (iii) economic integration and interconnectivity, (iv) transformation and inclusive and sustainable development, and (v) social inclusion.

The implementation of the ECOWAS 2050 Vision is based on the consideration of certain cross-cutting themes, including gender, youth and employment, digitalisation, climate change, resilience and capacity building.

4.2.3 CONVERGENCE PLAN FOR THE SUSTAINABLE MANAGEMENT AND USE OF FOREST ECOSYSTEMS IN WEST AFRICA (2013-2023)

Forests and woodlands occupy around 72 million hectares of West Africa's territory, around 14 % of the land area. The countries of the sub-region have more or less the same forestry problems with similar causes, which none of them are able to solve on their own. In the sub-region,

15 https://investmentpolicy.unctad.org/international-investment-agreements/treaty-files/5560/download
16 https://www.araa.org/sites/default/files/2023-07/ECOWAS%20VISION%202020.pdf

*The kob (*Kobus kob*), an antelope of the grasslands, floodplains and savannah forests, often finds itself in competition with humans who use the same land for agriculture. Mole National Park, Ghana. (© Ghana Wildlife Society)*

non-degraded tropical rainforests lost almost 7 million hectares per year between 2010 and 2019.
To respond to this situation jointly, the sub-regional institutions of the forest and wildlife sector, with the support of international intergovernmental and non-governmental institutions and organisations, initiated in 2006 a dialogue process on the forests of West Africa. The aim was to implement more effective management mechanisms to tackle the challenges triggered by cross-border or sub-regional aspects of forest and wildlife resource management, while improving cooperation between West African countries.

The forest dialogue process led to the implementation of the Convergence Plan for the Sustainable Management and Conservation of Forest Ecosystems in West Africa, commonly known as the Forest Convergence Plan (PCF). This plan serves as a reference framework, on the basis of which member states agree to 'federate' their national and sub-regional actions with a view to achieving the sustainable management of forests and wildlife and the enhancement of forest ecosystems in the sub-region.

Based on the ECOWAS vision, the PCF has set itself the following objective: 'the countries of West Africa manage the forest and wildlife resources of the sub-region in a sustainable and concerted manner for the well-being of the people and the protection of the environment by 2025'.

The PCF is structured around seven priority areas of intervention, which, through better coordination, should make it possible to improve forest values and achieve significant progress.
The PCF stresses the need to implement its plan at the national level, with each state developing the plan by identifying priority activities and allocating a budget to them.

The first PCF expired in 2023. At the end of this first decade of concerted management of forests and wildlife resources, some recommendations can be submitted to ECOWAS to support the development of the next convergence plan.

Unlike the forest ecosystems of Central Africa, which are relatively similar, the forest ecosystems of West Africa are very diverse: dense rainforests, semi-deciduous transitional forests and dry forests often integrated within a forest-savannah mosaic or even in the form of forest groves in a matrix of dominant savannahs. Although the pressures exerted on these varied ecosystems are similar, their management and conservation methods are very contrasted. Of the 16 countries involved in this convergence plan, more than half have no (or no longer any) dense rainforests. It is therefore complex to bring about convergence in such contrasting contexts. One possibility for ECOWAS would be to implement two distinct convergence plans, one for dry forests and the other for dense rainforests, or Guinean forests. This would make it easier to target priority actions for the sustainable management of these forests and their resources, and to facilitate consultation and cooperation between the six

The Bororo Fulani are nomadic herders and make up one of the three main communities in Gadabedji National Park in Niger. The others are the Tuareg and the Hausa. (© Wild Africa Conservation).

countries in which they are still present (Côte d'Ivoire, Guinea, Ghana, Liberia, Nigeria, and Sierra Leone).
In addition to the priority areas for intervention, the PCF could also include a system for monitoring and evaluating the achievement of conservation and management objectives. In this way, progress could be highlighted and corrective actions or strategies implemented in the event of delays or shortcomings. In addition, particular attention could be paid to communication of the convergence plan, in order to make it widely known among stakeholders of the management of Guinean forests in West Africa, and particularly among government institutions.

4.2.4 REGIONAL AGRICULTURAL POLICY OF WEST AFRICA: ECOWAP

Agriculture in West Africa, which underpins the economy and multiple social implications, faces a number of challenges, including low productivity and high environmental constraints.

This situation prompted the ECOWAS countries to adopt a regional agricultural policy in 2005. It is interesting to mention the link with natural resource management because, of the six priority areas identified, one is related to its improved management. More specifically, ECOWAP refers to the organisation of transhumance, rangeland management and the sustainable management of forest resources.

4.2.5 WAEMU COMMON ENVIRONMENTAL IMPROVEMENT POLICY

With reference to the amended Treaty of the West African Economic and Monetary Union (UEMOA), the Common Environmental Improvement Policy (PCAE) was adopted by Additional Act No. 01/2008/CCEG/UEMOA of 17 January 2008.

This policy reaffirms the links between the state of the environment, the health and well-being of populations, economic, social and cultural development, poverty reduction strategies and the stability of WAEMU member states. Natural resources are one of the foundations of the social and economic development of the Union's member states, whose primary sector is one of the pillars of economic growth. Among these resources, water, soil, forests and wildlife are the main assets in the hands of the people.

The PCAE is justified in that it works to strengthen sub-regional cooperation in the management of shared natural resources, to consolidate the governance of environmental resources, to build the capacities of member states and to mobilise more resources in order to make a significant contribution to improving the living conditions of the people of WAEMU.

The vision of this regional policy is 'the realisation of a socio-economic and geopolitical space restored in peace

→

A report on BIOPAMA's activities in 2020-2022

SIDEBAR 20 THE BIOPAMA PROGRAMME

The Biodiversity and Protected Areas Management (BIOPAMA) programme is an initiative of the Organisation of African, Caribbean and Pacific States (OACPS) financed by the EU's 11th EDF. Launched in 2011, it is implemented jointly by the IUCN and the European Commission's JRC. The programme aims to improve the long-term conservation and sustainable use of biodiversity and natural resources in protected areas and surrounding communities through the better use and monitoring of information and the development of management and governance capacities. The current phase of the programme is due to end in 2025. Its activities will continue with the support of new EU-funded programmes, namely – in Africa – the 'Regional Centres of Excellence (CoE) in science, technology and innovation (STI) programme'.

Through its knowledge management platform, the Reference Information System (https://rris.biopama.org/) and regional platforms, BIOPAMA provides up-to-date information and indicators at different levels (protected area, country, region) and gives access to numerous tools to support biodiversity management and the effectiveness, governance and equity of the management of PAs. The programme works closely with regional and national institutions, park management institutions, and other stakeholders to strengthen the management and governance of PAs.

Services

The regional observatories for protected areas and biodiversity are the central pillar of BIOPAMA's work. They support the collection, analysis, monitoring and reporting of data, develop the capacity of staff and organisations to manage this information, and provide policy guidance for better decision-making in terms of biodiversity conservation.
Mandated by well-established regional institutions, five regional observatories have been established during the BIOPAMA programme. Key regional partners include: the Secretariat of the Pacific Regional Environment Programme (SPREP), the University of the West Indies (UWI-CERMES) in the Caribbean, the Regional Centre for Mapping of Resources for Development (RCMRD), OFAC, the Ecological Monitoring Centre (CSE), and WAEMU in support of OBAPAO (https://www.obapao.org) . BIOPAMA is mainly engaged with national and regional agencies and institutions, with additional targeted interaction with protected area managers, field operators, and universities.

Grant mechanism

The BIOPAMA programme has a funding mechanism called the Action Fund, which has the following objectives:

- Support specific actions in the field aimed at strengthening the effectiveness of protected areas, natural resource management and governance;
- Implement recommendations arising from assessments of the effectiveness of protected area management and governance;
- Support activities enabling national agencies responsible for protected area management to implement their strategy in partnership with local communities, NGOs and other stakeholders;
- Contribute to the management of protected areas while improving the livelihood of local populations.

In this context, BIOPAMA's action fund in Central and West Africa, through five calls for project proposals, has been able to finance 50 conservation projects in 15 countries in this part of Africa for a total of EUR 5.8 million for national agencies and local and international NGOs for the governance and management of PAs and the improvement of the livelihood of local communities.

For more information on BIOPAMA, visit its official website a https://www.biopama.org/.

Source : Joint Research Centre, D.6 'Nature Conservation and Observations'.

and good governance, strongly integrated into a healthy environment, whose balanced natural resources support the sustainable development of communities in the sub-region, in particular their freedom from disease, poverty and food insecurity'. It has the following three objectives: (i) to reverse the major trends in the degradation and reduction of natural resources; (ii) to reverse the degradation of living environments and settings; and (iii) to maintain biodiversity.

In order to achieve its objectives, the PCAE is being implemented along the following 4 lines of action: (i) contributing to the sustainable management of natural resources to combat poverty and food insecurity; (ii) managing human settlements and combating pollution and nuisance to promote a healthy and sustainable environment in the Community; (iii) capacity building for concerted and sustainable management of the environment; and (iv) monitoring the implementation of multilateral agreements on the environment.

4.2.6 REGIONAL SUPPORT PROGRAMME FOR THE INTEGRATED MANAGEMENT OF TRANSBOUNDARY ECOSYSTEMS

The creation of the Regional Support Programme for the Integrated Management of Transboundary Ecosystems (PAGIET) as a strategic planning instrument for the UEMOA PCAE for the period 2016-2023, following the example of the ECOWAS PCF, is justified, among other things, by the predominance of inefficient and unsustainable management practices for transboundary ecosystems. This situation is due to a number of factors, including (i) the weak effectiveness of regional governance frameworks for transboundary ecosystems and (ii) the weak effectiveness of mechanisms for the preservation and sustainable development of these ecosystems.

The overall objective of PAGIET is to contribute to improving integrated management practices for transboundary ecosystems in West Africa. It has the following specific objectives: (i) to strengthen the effectiveness of regional governance frameworks for transboundary ecosystems; and (ii) to strengthen the effectiveness of mechanisms for the conservation and sustainable development of transboundary ecosystems.

The programme is structured around 2 areas of intervention as follows: (i) strengthening the effectiveness of regional governance frameworks for transboundary ecosystems; and (ii) strengthening the effectiveness of mechanisms for the preservation and sustainable development of transboundary ecosystems.

PAGIET also contributes to the implementation of global development agendas, particularly with regard to Sustainable Development Goals 12 'Achieve responsible consumption and production', 13 'Take urgent action to combat climate change and its impacts', 14 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development' and 15 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss'; multilateral environmental agreements (Convention on Biological Diversity, Ramsar Convention, CITES, Abidjan Convention, African Convention on the Conservation of Nature and Natural Resources, etc.).

It is also fully consistent with the intervention strategies of ECOWAS, through its Convergence Plan for the Management and Sustainable Use of Forest Ecosystems in West Africa, and of technical and financial partners at regional level, in this case the European Union, through the thematic programmes of its NDICI-Global Europe instrument, its wildlife conservation strategy for West Africa and its recent NaturAfrica initiative.

4.2.7 REGIONAL STRATEGY FOR THE MANAGEMENT OF PROTECTED AND CONSERVED AREAS IN WEST AFRICA UP TO 2050

With regard to the conclusions of the CBD's COP15, the main one being the new **'Kunming-Montreal'** Global Biodiversity Framework for the post-2020 period, which aims to protect land, oceans and species from pollution, degradation and the climate crisis, the parties agreed on a roadmap, one objective of which is to protect 30 % of land and 30 % of the seas by 2030.

In this context, one of the ways of preserving biodiversity is through the creation and management of protected areas (IPBES, 2019). Indeed, protected areas represent an

effective solution for combating the collapse of biodiversity and protecting threatened ecosystems, as was also recognised at the first Congress of African Protected Areas in Kigali (Rwanda) in July 2022.

To date, in West Africa, several regional policies, programmes and/or sectoral strategies integrate, to varying degrees, the issue of protected areas without ensuring real coordination in the operationalisation of these policies, at regional level, in order to ensure more effective management of protected areas.

This **Regional Strategy for the Management of Protected and Conserved Areas (PCAs) in West Africa up to 2050** therefore aims to be a strategic reference in the fight against the erosion of biodiversity in the West African sub-region. It aims to provide guidance to the states of the ECOWAS region and Mauritania, regional organisations, NGOs, the international community, donors and partners working together to achieve the global objectives of the CBD, in terms of preserving biodiversity and managing PCAs by 2050.

The vision of this regional strategy is: '**By 2050, biodiversity and protected and conserved areas (PCAs) in West Africa are managed sustainably and contribute significantly to socio-economic development, improved well-being and resilience of populations**'.

Its overall objective is to reverse the loss of biodiversity and ecosystem services and sustainably improve people's livelihoods through a representative and well-managed network of protected and conserved areas (PCAs) in West Africa. More specifically, this involves: (i) develop and manage in a coordinated manner a coherent, secure and resilient regional network of PCAs, particularly in the face of climate change; (ii) sustainably manage the impacts of economic activities on biodiversity and PCAs; (iii) strengthen and support activities for the sustainable enhancement of biodiversity within and on the periphery of PCAs; and (iv) build capacity and knowledge to effectively manage PCAs and conserve biodiversity.

To meet the challenges of biodiversity conservation and the management of protected and conserved areas, the regional strategy is based on a theory of change according to which urgent strategic action at regional, national and local levels is needed to transform economic, social and financial models, so as to stabilise the trends responsible for the worsening loss of biodiversity, and enable the recovery of natural ecosystems with net improvements by 2050.

The strategy is structured around a strategic framework closely linked to the SDGs, the strategies of the three Rio Conventions (UNCCD, UNFCCC and CBD), the African Union Commission's Agenda 2063, the Kigali Call to Action, and the sectoral policies and strategies of WAEMU and ECOWAS.

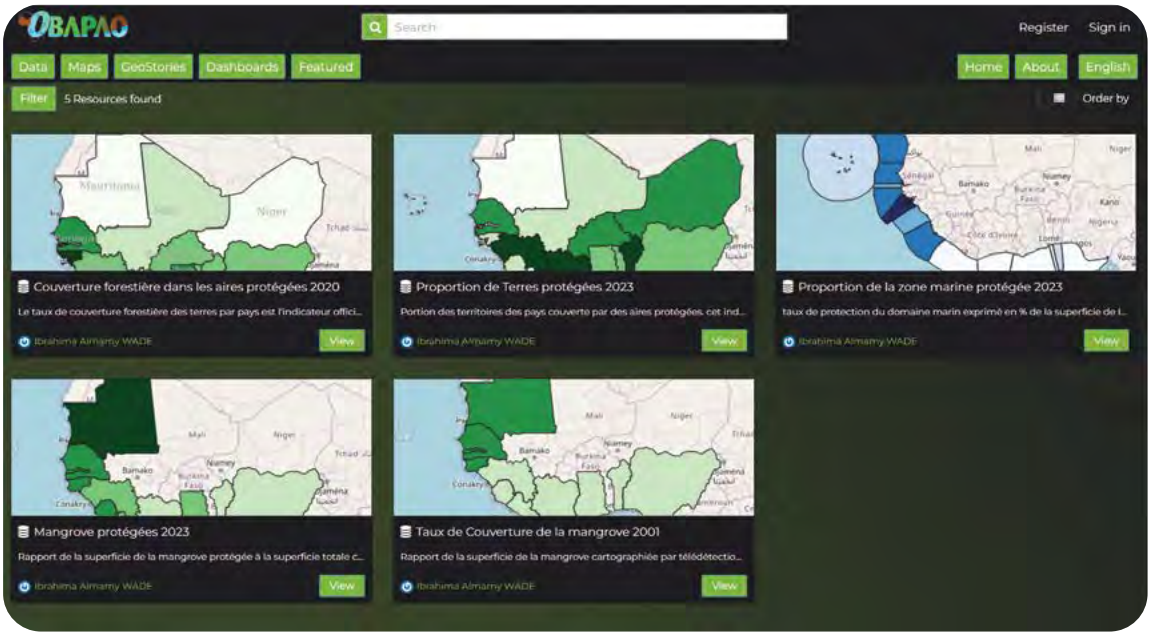
It comprises four strategic areas: (i) development and coordinated management of a coherent, secure and resilient regional network of PCAs, particularly in the face of climate change; (ii) sustainable management of the impact of economic activities on biodiversity and PCAs; (iii) strengthening and supporting activities for the sustainable use of biodiversity in and around PCAs; and (iv) building capacity and knowledge to effectively manage PCAs and conserve biodiversity.

4.2.8 WAEMU AGRICULTURAL POLICY (PAU)

The WAEMU Agricultural Policy (PAU) was adopted by Additional Act N°03/2001 of 19 December 2001 by the WAEMU Conference of Heads of State and Government. Its overall objective is to 'contribute in a sustainable manner to meeting the food needs of the population, to the economic and social development of Member States and to poverty reduction'. More specifically, it aims to: (i) achieve food security; (ii) increase agricultural productivity and production in a sustainable manner; and (iii) improve the living conditions of producers by developing the rural economy.

The PAU covers all agricultural, forestry, livestock and fisheries activities. It applies to all agricultural products, broadly defined as all products derived directly from these activities and those resulting from processing essential to their initial use.

In the context of sustainable and resilient agriculture at community level, the PAU, which is currently being reviewed with a focus on agro-ecology, could enable greater account to be taken of certain environmental concerns, with a view to substantially and sustainably increasing agricultural productivity with a view to achieving food and nutritional security. These concerns include preserving biodiversity by practising agriculture that respects existing ecosystems (promoting agroforestry, for example); the sustainable management of land and water as part of farming practices; and the sustainable management of pesticides, fertilisers and their packaging through the implementation of appropriate mechanisms at all levels.



OBAPAO's Geonode is a geospatial content management system for biodiversity and ecosystems in West Africa

4.3 MONITORING THE GUINEAN FORESTS

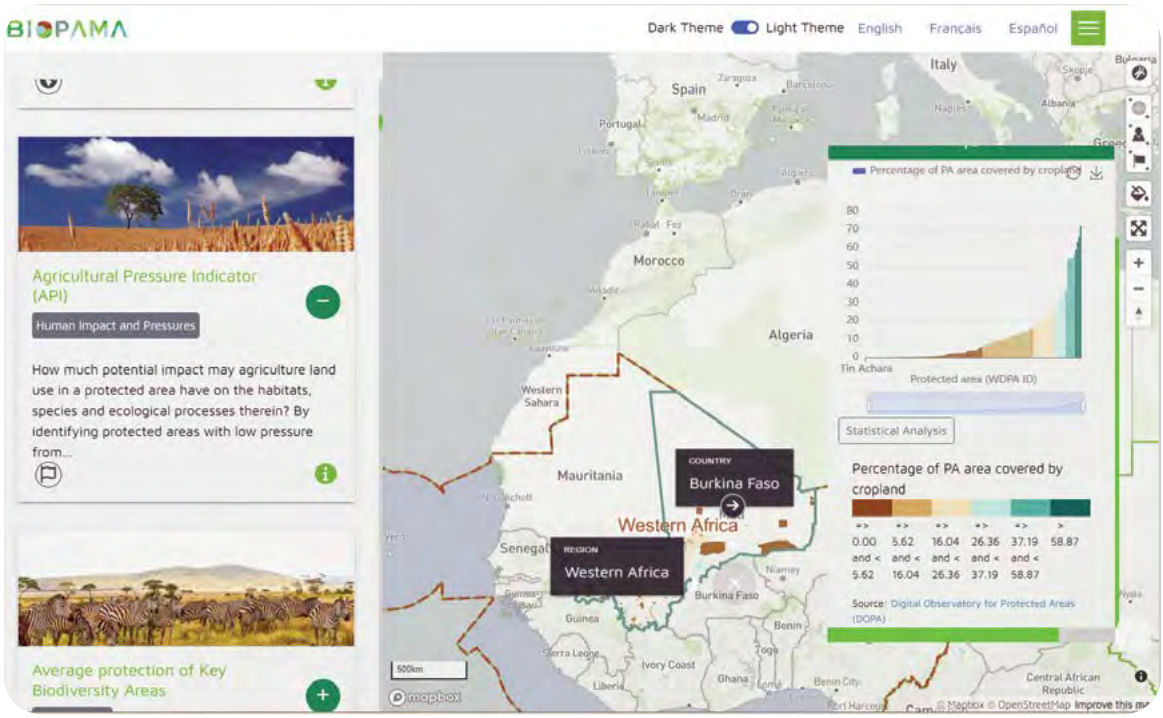
4.3.1 THE REGIONAL OBSERVATORY FOR BIODIVERSITY AND PROTECTED AREAS IN WEST AFRICA

The Regional Observatory for Biodiversity and Protected Areas in West Africa (OBAPAO) pursues the general objective of *'improving the long-term maintenance of biodiversity in West Africa, by encouraging the use of the best scientific knowledge and data, and by developing capacities to support policies and decision-making on subjects relating to the conservation of biodiversity and the sustainable management of protected areas'*.

To achieve this objective, OBAPAO has a data and information repository on biodiversity and protected areas in West Africa. This new repository, through various modules, allows to i) monitor progress towards achieving conservation objectives, ii) assess the performance of protected areas, iii) analyse conservation scenarios, or simply browse facts, figures and maps. Based on GeoNode technology to facilitate the sharing of important data, this repository aims to be sustainable and adapted to the needs of West African states. It is part of the BIOPAMA reference information system.

The BIOPAMA programme is a EU-funded initiative aimed at building a solid information base for decision-making on protected areas and biodiversity in 79 countries of the African, Caribbean and Pacific (ACP) group of states.

The basic development of the repository is being carried out by a number of West African centres: the Ecological Monitoring Centre and the Regional Network of Marine Protected Areas in West Africa (RAMPAO) in Senegal, the Regional Marine Centre in Ghana and the AGRHYMET Regional Centre in Niger. These centres are supported by the European Commission's Joint Research Centre (JRC) and by the West Africa regional office of IUCN. WAEMU is the institutional host of OBAPAO, and all West African countries are beneficiaries.



The BIOPAMA regional reference information system

4.3.2 THE EUROPEAN COMMISSION'S JOINT RESEARCH CENTRE

The Joint Research Centre (JRC) is the European Commission's scientific and technical research laboratory. It was created to provide the scientific advice and technical know-how needed to support policy orientations. The JRC's mission is to provide scientific and technical support for the conception, development, implementation and monitoring of policies by responding to their demands. As a service of the European Commission, the JRC acts as a reference centre in terms of science and technology.

The main criticisms that can be made of the many tools available are the proliferation of initiatives carrying out similar activities, rather than the consolidation of existing initiatives or the creation of synergies between them; a sometimes inadequate updating of monitoring data, which could be much improved by pooling resources; and, lastly, interfaces that are sometimes very unintuitive to use, for example the BIOPAMA portal (https://rris.biopama.org/) which has many functions whose differences or even usefulness are difficult to understand.

4.4 OTHER STRATEGIES RELATED TO SUSTAINABLE FOREST MANAGEMENT IN WEST AFRICA

4.4.1 REGIONAL STRATEGY FOR CLIMATE IN WEST AFRICA

In 2022, West Africa adopted its first regional climate strategy, with the aim of strengthening cooperation between its member states on policies for adapting to the effects of climate change that are already underway, and implementing development trajectories with low greenhouse gas emissions. It is a realisation of the Paris Climate Agreement, signed in 2015, to which all ECOWAS countries are parties.

While the region is still characterised by resource-intensive economic models that contribute to environmental degradation, it should be mentioned that five of the world's 10 most vulnerable countries facing climate change are in West Africa. While common objectives exist, we need to go

SIDEBAR 21 THE DIGITAL OBSERVATORY FOR PROTECTED AREAS

In order to strengthen biodiversity conservation initiatives, the EU is developing strategies to improve the effectiveness of international governance of biodiversity and ecosystem services and, more generally, to improve the mobilisation and use of data, information and forecasts related to biodiversity to make them accessible to political decision-makers, managers, experts and other users. Within this framework, the JRC of the European Commission has developed the Digital Observatory of Protected Areas (DOPA) to provide a wide range of end-users with the means to assess and monitor the status of protected areas and the pressures they face at local, national, regional and global scales.

DOPA is a global reference information system that provides key information on biodiversity at country, eco-region and site level via web services. To ensure transparency and the reuse of its work, DOPA has been developed using open standards for spatial data and free programming languages. It is now hosted and developed within the Commission's Knowledge Centre for Biodiversity (KCBD) (https://knowledge4policy.ec.europa.eu/biodiversity_en). Identified by the secretariat of the CBD as a recommended reference information system, DOPA gathers data produced not only by the JRC (many products derived from earth observation) but also by third parties (e.g. UNEP-WCMC, IUCN, FAO, World Bank).

Activities
DOPA provides end-users with reference information on PAs and conservation efforts through a range of web services and applications. By processing and integrating a wide range of data from different international institutions, DOPA provides access to the results of powerful analyses that are often difficult to carry out locally. This information can help national authorities prepare strategies and reports such as national biodiversity strategies and action plans and national CBD reports, help donors identify areas of critical value and need, and help decision-makers define priorities for action.

DOPA is regularly updated with the World Database on Protected Areas (> 250 000 protected areas) and the IUCN Red List of Threatened Species (> 25 000 species), enabling it to automatically produce indicators focusing on biodiversity, anthropic pressures, ecosystem services and financing. The datasets processed have a resolution ranging from 30 m to 5 km, depending on the variables, and all are integrated into a single database (840 billion pixels).

Services
DOPA results are made available to end-users in two different ways:

1. Via web services: the results of the processing can be consulted directly by other machines to enable the data to be used and integrated into other platforms. These external end-users are generally part of BIOPAMA in ACP countries, development agencies, the CBD secretariat, IUCN, and other partners and entities.
2. Via a web interface: DOPA Explorer is the current interface for the DOPA database. It provides end-users with a web-based tool for interacting with the maps and viewing pre-processed information. It was decided not to update DOPA Explorer, as it proved to be too complicated for many end-users who are not familiar with online mapping tools. The update and maintenance is also particularly complex. A new version will be developed in 2024.

Link to the DOPA website: https://dopa.jrc.ec.europa.eu/dopa/

Joint Research Centre, D.6 'Nature conservation and Observations'

SIDEBAR 22 THE ENVIRONMENTAL CRIME INFORMATION SYSTEM IN WEST AFRICA

As part of the PAPBio programme, an Environmental Crime Information System (SICE) in West Africa has been developed and made available online. Integrated into the OPABAO, this system illustrates the spatio-temporal dynamics of environmental crimes recorded in the region. These are represented on a map of the region, showing the type of offence, the country of apprehension, the country of destination and the country of origin of the product. Various summary graphs show the number of violations observed by country and by type. The various environmental crimes included in the system are poaching, illegal wildlife trafficking, water and air pollution, logging, fishing, grazing and other illegal activities.

The players responsible for informing SICE are administrations in charge of water and forests, wildlife, protected areas, fisheries and fishing resources, customs, police and all other law enforcement agencies. To facilitate the mobilisation of data, a collaboration and data-sharing protocol has been developed, and several information and awareness-raising meetings on the use of SICE have been organised with the administrations concerned in West African countries.

Link to SICE: https://sice.obapao.org/

further by providing the most exposed sectors, such as agriculture, with solid assessments of the effects of global warming and proposing responses at regional level. ECOWAS also intends to play a role in helping its member countries preserve their forests and the carbon stock they represent.

The Paris Agreement laid essential foundations for global governance, ensuring consistency between international commitments and public policies implemented at national and local levels, using a tool common to all 180 party states: Nationally Determined Contributions (NDC). This should reflect mitigation and adaptation commitments at their highest level of ambition and take into account the circumstances of each country.

At the regional level, potential actions have been identified to support member states, including (i) joint efforts to create economies of scale, (ii) strengthening regional leadership, particularly during negotiations, (iii) capitalising regionally on public policies and innovative practices, and (iv) supporting national policy initiatives and guidelines.

4.4.2 REGIONAL STRATEGY AND POLICY RECOMMENDATIONS FOR THE PLANNING AND MANAGEMENT OF PROTECTED AREAS IN THE FACE OF CLIMATE CHANGE

The Protected Area Resilience to Climate Change (PARCC) project was implemented from 2010 to 2015 by UNEP through its WCMC, in collaboration with IUCN. One of the main outputs of the PARCC project is the development of a regional strategy for the management of PAs in the context of climate change. Although the countries covered by Guinean forests in West Africa were not among the countries consulted to determine this strategy, apart from Ghana, the recommendations made can serve as a basis for integrating resilience to climate change into the management objectives of PAs in the region.

As part of the strategic objectives to i) strengthen conservation programmes by improving the performance of existing PAs and creating new PAs, and ii) anticipate environmental change, it is planned to ensure the

Negotiations between Côte d'Ivoire and the EU on the VPA in Brussels, June 2014. (© EFI)

conservation of the elements that justified protection and the creation of connectivity corridors between PAs to encourage changes in the future distribution areas of species (see also Chapter 5, Section 5.2.2: The creation of ecological corridors).

The regional strategy also aims to strengthen regional cooperation by harmonising national policy and legislative frameworks, and to integrate climate change into transboundary PA planning.

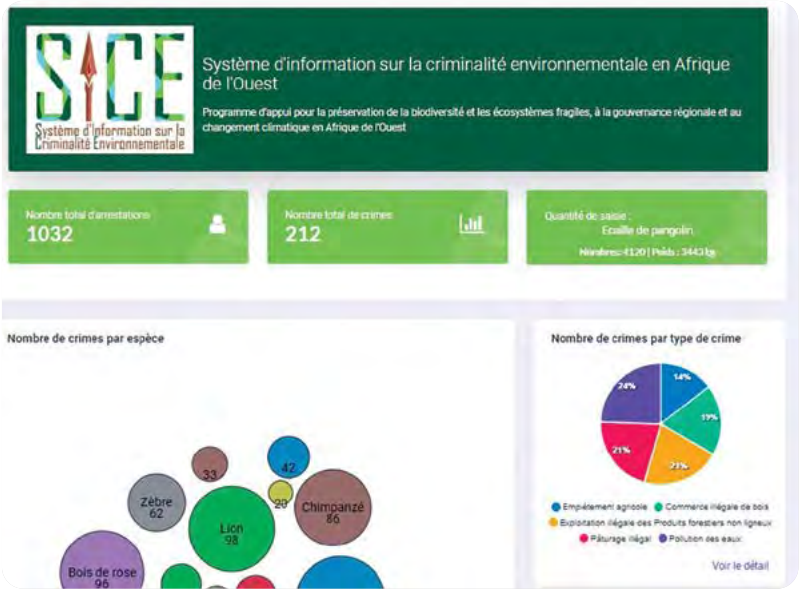
4.4.3 FLEGT ACTION PLAN

The West African region is committed to fighting illegal logging through the implementation of the Forest Law Enforcement, Governance and Trade (FLEGT) action plan (see also Sidebar 10: Different opportunities to reduce the negative impacts of industrial logging). This plan, implemented by the EU, aims to improve forest governance, strengthen law enforcement, and promote legal and sustainable trade practices.

4.4.4 REGIONAL STRATEGIES FOR THE CONSERVATION OF ANIMAL SPECIES

Animal species know no borders, and several regional strategies are designed to contribute to their conservation. For West Africa, there is a regional action plan for the conservation of West African chimpanzees and a memorandum of understanding (MoU) for the conservation of West African elephants signed by Côte d'Ivoire, Guinea, Liberia, Nigeria and Sierra Leone in 2005 and by Ghana in 2007. These documents establish the framework for the conservation, maintenance and restoration of West African chimpanzee and forest elephant populations in West Africa. They also list, either directly or by reference to an existing action plan, the objectives to be achieved and the priority actions to be implemented.

- 2020-2030 Regional action plan for the conservation of western chimpanzees (*Pan troglodytes verus*): https://portals.iucn.org/library/sites/library/files/documents/2020-015-EN.pdf
- MoU regarding conservation measures for the African elephant population of West Africa (*Loxodonta cyclotis*): https://www.cms.int/en/legalinstrument/west-african-elephants-mou



An information system on environmental crime in West Africa (SICE) is hosted on the OBAPAO platform.

4.4.5 REGIONAL STRATEGIES TO COMBAT ENVIRONMENTAL CRIME

There are also regional strategies to fight wildlife trafficking and other illegal activities that pose threats to ecosystems, their ecological functions, the resources they contain and the services they support. In particular, ECOWAS called for a strong response to the extinction crisis at the 19th meeting of the CITES Conference of the Parties in October 2022. The declaration called on CITES to support West Africa's efforts to protect species threatened by international trade, to implement measures to reduce the health risks associated with wildlife trade, and to establish and maintain a CITES implementation fund to finance the fight against wildlife crime.

As part of component 2 'Regional Governance' of the PAPBio programme (see also Sidebar 24: The support programme for the preservation of biodiversity and fragile ecosystems, environmental governance and climate change in West Africa), an Environmental Crime Information System (SICE) has been set up, with the aim of 'strengthening cooperation in the fight against environmental crime and ensuring the security of conservation areas'. This initiative focuses on four types of activity:

1. Develop and supply a regional information system on environmental crime, accessible to those involved in management and control;
2. Support the strategic and operational technical capabilities of the chain of control and surveillance of conservation areas;
3. Harmonise legal frameworks and stimulate cooperation between states in the fight against environmental crime;
4. Strengthen regional mechanisms, capabilities and instruments for the protection of threatened and endangered species.

5

SUGGESTED STRATEGIES FOR THE SUSTAINABLE MANAGEMENT OF WEST AFRICA'S DENSE RAINFORESTS

5

SUGGESTED STRATEGIES FOR THE SUSTAINABLE MANAGEMENT OF WEST AFRICA'S DENSE RAINFORESTS

Protected areas are at the core of the nature conservation strategy in Africa and are one of the approaches developed for the long-term conservation of flora and fauna. Chapter 2 highlighted how the best-preserved areas of forest in West Africa are located in PAs and forest reserves, particularly those that benefit from technical and financial support from donors and their development partners, both public and private. Funding for PAs should ideally be designed over a long-term period (minimum 10 years).

Other classified area models can be developed for the purpose of preserving forest ecosystems and their biodiversity. Various approaches that have proved effective in the context of PAs in West Africa are described in this chapter: the identification of priority areas, the landscape approach and associated strategies, public-private partnerships (PPPs), collaboration with indigenous peoples and local communities (which can take various forms), awareness-building and environmental education, and, finally, research as a tool for monitoring the effectiveness of management and conservation. Examples of implementation in the PAPFor landscapes, identified as a priority in the analysis of the EU strategy document *Larger than Elephants*[17], are presented here to illustrate these approaches.

5.1 IDENTIFICATION OF PRIORITY AREAS

In a context of increasing anthropic pressures and where climate change is affecting even the most remote and inaccessible areas, it is important to focus the resources available for conservation towards PAs with the highest conservation potential. Compared to other regions in Africa, PAs in the West African forest zone often cover small areas that are home to viable populations of species emblematic of African biodiversity. It is therefore essential to preserve the connectivity between PAs. This strategy is reflected in the identification of key landscapes for conservation and development (KLCDs), managed using a landscape approach described in the next section.

5.2 THE LANDSCAPE APPROACH

A conservation approach limited only to PAs has shown its limits. A protected area is an agent of economic development and must contribute to spatial planning. The landscape approach enables the protected area to be used as an entry point for developing activities beyond its limits that should contribute to sustainable development, based around green industries and improved governance structures. The main species and ecosystems conserved in protected areas, and in the ecological corridors linking

17 https://op.europa.eu/en/publication-detail/-/publication/d76ac7eb-bc4a-11e6-a237-01aa75ed71a1

SIDEBAR 23 OTHER EFFECTIVE (AREA-BASED) CONSERVATION MEASURES

'Conventional' protected areas are an important part of the answer to the various threats that habitats and biodiversity are facing around the world, and this book focuses primarily on this type of area, whose primary objective is conservation. However, it is important to highlight that there exist other approaches to protecting certain areas, in particular through what is known as Other Effective (area-based) Conservation Measures (OECMs). Although the OECM framework is emerging as an alternative approach to effective conservation of biodiversity and natural resources outside of the conventional protected areas, their governance and management arrangements have yet to be developed to ensure the equitable management of natural resources over the long term.

What is an OECM?
The term Other Effective (area-based) Conservation Measure describes a geographical area that is not a protected area but has valuable biodiversity and guarantees long-term ancillary or direct conservation of natural resources within a framework of equitable governance and management. Unlike PAs, whose primary objective is conservation, OECMs can be managed for a range of primary objectives, including production, but must deliver conservation outcomes as a secondary objective.

Who manages OECMs?
OECMs can be governed by a variety of rights holders and actors, including indigenous peoples and local communities, government agencies, as well as sectoral actors, private organisations and individuals.

OECMs should only be recognised in areas that meet the criteria of the CBD.

How do OECMs differ from protected areas?
Protected areas and OECMs differ in two important ways:

- Protected areas are designated and managed following a primary conservation objective, such as preserving the habitat of a threatened species. Their main function is to promote biodiversity conservation within a given site.
- OECMs contribute to the sustainable management of natural resources and/or ecosystem services and the effective conservation of biodiversity, without this being their primary objective.

What types of areas do OECMs cover?
OECMs can be found on public estates, private land, community lands and indigenous territories. Examples of OECMs include: fallow land within agricultural systems, conserved water catchments, locally managed marine areas, community forests, and high conservation value (HCV) areas such as corridors between protected areas and their neighbouring zones.

How are OECMs designated?
The designation of OECMs must be made on a voluntary basis and with the free, prior and informed consent of the indigenous peoples and local communities of the area.

them, enable the maintenance of a range of goods and services essential to local populations. The involvement of all stakeholders in the land-use planning process is a key factor for conservation, improvement of the governance structures it must support, and the development of initiatives and setting up of equipment and infrastructure in support of sustainable development.

The main criteria for identifying these landscapes are: the protection of a functional ecosystem with viable animal and plant populations; the protection of wildlife migration zones; the protection of the most important populations of animal species emblematic of West Africa (forest elephant, pygmy hippopotamus, chimpanzee, gorilla, etc.); the protection of areas of endemism and sites of regionally important diversity; and their role in the preservation of a natural resource of major importance to human populations. These criteria, and the large surface area covered by KLCDs, make them relatively resilient to the effects of climate change.

In addition to conservation work, the purpose of these landscapes is to support a green economy that benefits local communities.

These landscapes include areas with a variety of uses, ranging from community forests and agricultural or livestock areas to forestry or mining operations, for example. Taking into account the different land uses and human activities practised by the local communities living within PAs is an important part of the landscape approach.

The landscape approach forms the basis of *Larger than Elephants – Inputs for an EU strategic approach to wildlife conservation in Africa*, published in 2015 and in the course of being updated. The selection of PAPFor programme landcapes was based on this strategic approach for West Africa, and the same approach is being followed in the new NaturAfrica programme.

The majority of these KLCDs consists of transboundary protected areas.

5.2.1 THE APPROACH OF TRANSBOUNDARY CONSERVATION AREAS

The identified key landscapes often extend over several countries to form transboundary conservation areas (TBCAs). The aim of TBCAs is to reconcile conservation and development, but also promote culture and peace (hence the frequently used name, 'peace park'). When the protected areas in the TBCAs are not contiguous, the inter-zones are often taken up by forestry or mining concessions with which the aim is to develop collaborative relationships for conservation, or even PPPs.

Gorillas in Cross River National Park, Nigeria. The park is part of one of the key landscapes for conservation and development (KLCD) identified for EU support in sub-Saharan Africa. (© WCS)

SIDEBAR 24 THE GOLA PEACE PARK, AN EXAMPLE OF A TRANSBOUNDARY CONSERVATION AREA

Among the PAPFor landscapes, a good example of a TBCA is the Gola Peace Park (also known as the Gola Transboundary Forest Landscape or Greater Gola Landscape) between Liberia and Sierra Leone. The Gola Peace Park was established in 2011 by the two countries, which, despite having different approaches to conservation, are working together to ensure the conservation of this important forested area. Taking over the PAPFor programme, NaturAfrica is funding the 'Across the River - a Transboundary Peace Park for Sierra Leone and Liberia' project, which aims to bring together the Gola National Park in Liberia and the Gola Rainforest National Park in Sierra Leone, with an additional forested area acting as an ecological corridor. Overall, almost 350 000 ha of forest are covered by the peace park. Community forests have been set up to encourage forest connectivity, and various activities compatible with the preservation of the forest environment have been developed (beekeeping, farmers' field schools, planting of nitrogen-fixing leguminous plants to enrich the soil, agroforestry cultivation of cocoa trees, etc.). Local community surveys have shown that these initiatives improve their well-being and income.

In collaboration with the government, civil society groups, international NGOs, and community partners in both countries, the project contributes directly to the protection and conservation of one of the largest remaining boundaries of the Upper Guinean rainforest, a globally important biodiversity hotspot. The long-term financing of the conservation and management of this area is ensured by a carbon-financing programme (avoiding deforestation and carbon sequestration).

On the one hand, the positive impact of conservation activities helps to protect animal populations, while on the other it also increases the risk of human-wildlife conflict. In the Gola Peace Park, incidents of crop looting are becoming more frequent. Furthermore, the development of cocoa cultivation also increases damage to crops. It is therefore crucial for the success of the project to address this issue, in particular through initiatives facilitating co-existence and deterrent measures.

An ecological corridor between Wonegizi and Wologizi parks in Liberia. (© M. Languy)

An effective strategy for initiating transboundary cooperation and partnerships is to organise regular meetings and exchanges between governmental technical services. They can then communicate relevant information and common issues to their respective institutions. This way, formal agreements can emerge through the initiative of governments.

Within TBCAs, and across KLCDs more generally, it is essential to maintain the connectivity between protected areas in order to ensure the free movement of species, which is particularly important in fragmented environments such as the Guinean forests. Connectivity is maintained by means of networks, sets of PAs linked by ecological corridors and included within a mosaic of areas managed sustainably for objectives other than conservation. These networks could also evolve towards an OECM status, as mentioned in the previous paragraphs. Maintaining forest cover beyond the PAs is an important objective of the PAPFor and NaturAfrica programmes.

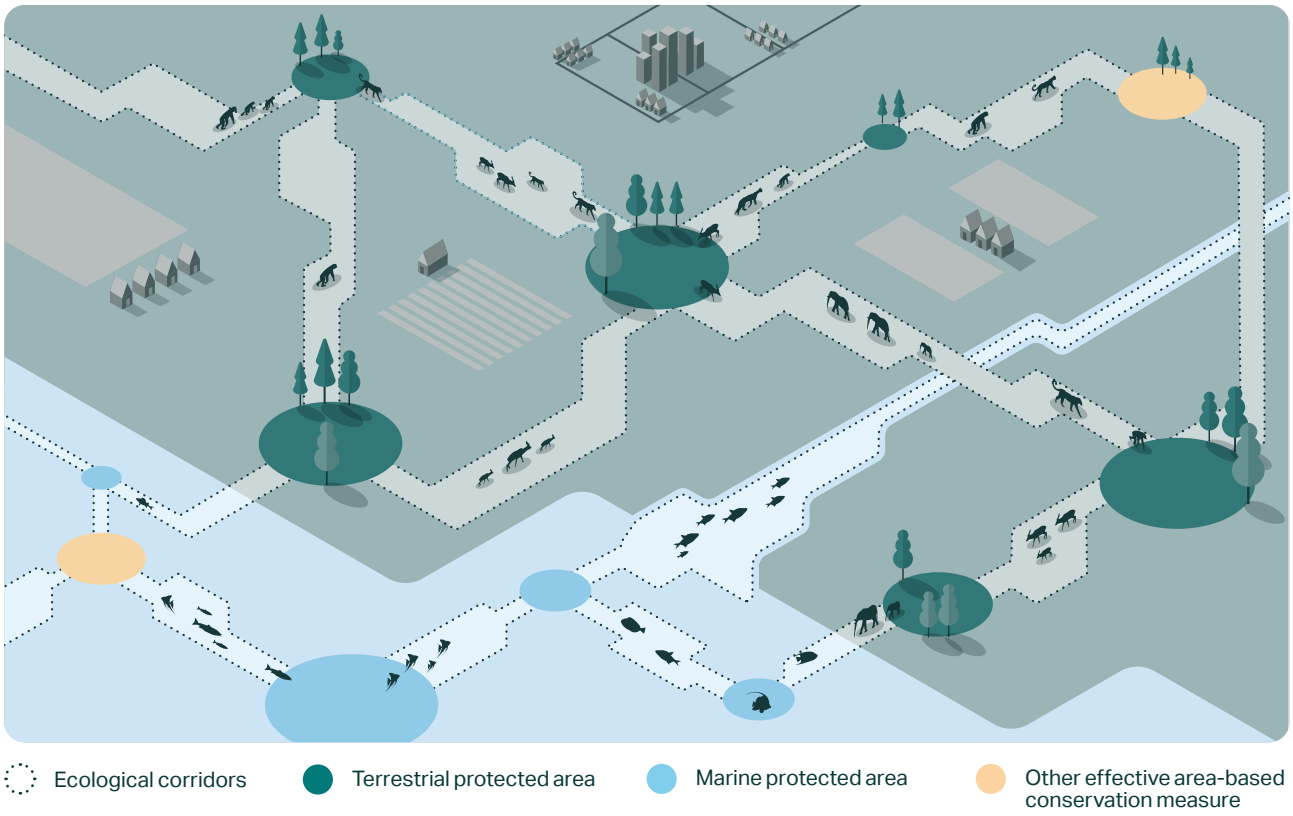
5.2.2 ECOLOGICAL CORRIDORS

Ecological connectivity is defined as the unimpeded movement of species and natural processes within a given geographical area. The break-up of habitats, such as the fragmentation of forest ecosystems, as well as the omnipresence of human activities within these areas leads to a breakdown in ecological connectivity, and as a consequence increases the risk of species extinction.

It is necessary for PAs to be connected in order to guarantee the movement of species, ensure the genetic diversity of populations, and maintain the functioning of ecological processes (Figure 26).

The characteristics of these corridors (structure, type of habitat, size, shape, etc.) must be determined according to the species or processes of the connectivity they must ensure, in other words: according to their objectives. The conservation objectives of an ecological corridor include the following: i) promoting genetic exchange; ii) ensuring the movement of a species to meet its ecological needs (reproduction, life cycle, migration, etc.); iii) providing habitat during seasonal, daily or multigenerational movements; iv) preserving ecological processes

FIGURE 26 Guidelines for conserving connectivity through ecological networks and corridors. Illustration adapted from Hilty et al., 2020.



(pollination, dispersal, etc.); v) promoting changes in distribution areas and adaptation to global changes (including climate change); vi) promoting reconstitution and re-colonisation after a disturbance; and vii) preventing undesirable processes, in particular the spread of fires. Provided their conservation objectives are respected, ecological corridors in particular may be subjected to human activities that are compatible with the sustainable conservation of resources.

Within the context of forest ecosystems, the maintenance or restoration of forest cover in (potential) ecological corridors is essential. For example, reforestation activities can help to re-establish ecological flows between two protected forest areas that have been isolated as a result of deforestation or forest fragmentation. These activities can be implemented with the support of local communities living in proximity to the PAs, or even integrated into a rural development programme. Connectivity can be partly restored through agroforestry farming practices, for example.

Landscape approaches, involving the maintenance of forest cover and the creation (or maintenance) of ecological corridors, are particularly relevant in the context of the highly fragmented environments that characterise the Guinean forests of West Africa.

Other landscapes covered by the PAPFor and NaturAfrica programmes which should be highlighted include initiatives in the Bossou corridors in Guinea (linking the Bossou hills to the Nimba reserve); the connectivity between Outamba NP (Sierra Leone) and the future Pinselli-Soyah-Sabouyah PA (Guinea); the identification of forest corridors between Wologizi and Wonegizi (Liberia) and between these and the Ziama Reserve (Guinea); and the connectivity between Cross River National Park and various adjacent forest reserves and sanctuaries (Nigeria).

5.2.3 DEVELOPMENT OF SUSTAINABLE PRODUCTION AND PROCESSING CHAINS

Within a landscape, in areas that are not dedicated to conservation, it is essential to support industries (agricultural: palm oil, rubber, cocoa, coffee, etc.; forestry: timber, fuelwood, etc.; or mining) in order to implement sustainable production, processing and transport practices. Given the surface covered by these production areas in West Africa, the significant overlap that exists between these concessions and PAs, and the importance that these production areas have for the socioeconomic development of West African countries, the involvement of stakeholders from the production sector in the planning and integrated management of the territory is essential.

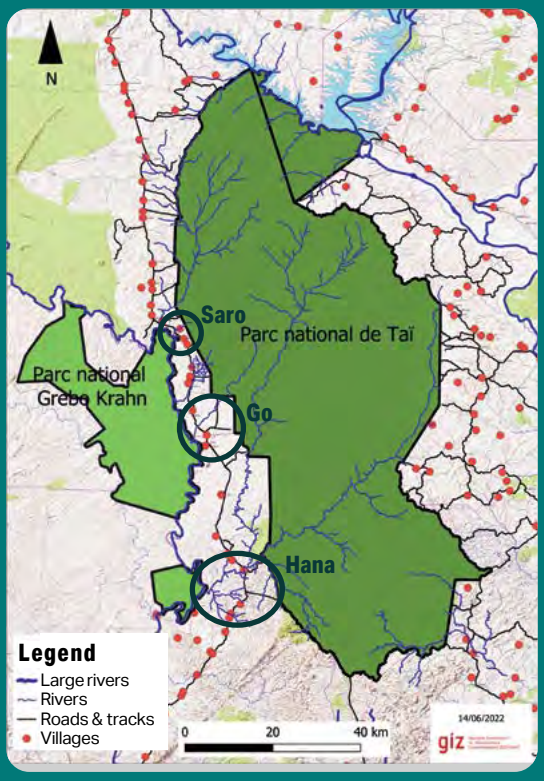


Image 1: Location of feasibility study sites and choice of sites on the Saro River

Image 2: Map of impacted plots (2021). ©UEP-TGS.

SIDEBAR 25 THE ECOLOGICAL CORRIDOR APPROACH BETWEEN THE TAÏ (CÔTE D'IVOIRE) AND GREBO-KRAHN (LIBERIA) NATIONAL PARKS

Since the 2000s, the TGKS landscape has attracted the attention of nature conservation authorities due to the significant risks of habitat fragmentation between the two national parks that was anticipated in the medium to long term. Following a commitment by the governments of Côte d'Ivoire, Liberia and their partners at a meeting in Monrovia in 2009 to take action in the context of cross-border collaboration, the German development agency put forward two biodiversity conservation projects focused on (i) support for the sustainable management of the protected areas, and (ii) enhanced ecological connectivity between the parks. In fact, one of the major challenges remains the maintenance of the genetic exchanges that are vital to the long-term survival of populations of animal and plant species within PAs that are in the process of becoming insular.

The designation of the Grebo National Forest as the Grebo-Krahn National Park in 2017 is the first link in this enhanced connectivity between the Taï and Sapo National Parks, with the TGKS landscape now containing three national parks. However, there remains a need to ensure connectivity between Taï and Grebo-Krahn and between Grebo-Krahn and Sapo.

Image 1
This connectivity between PAs is planned in a concrete manner through the creation of physical corridors, and in a more abstract way through the maintenance or restoration of a certain level of forest cover on the periphery of these corridors. Although the forest cover between the two parks on the Liberian side was not yet very degraded in the FMC-F forest management concession, the situation was very different in Côte d'Ivoire, with agricultural use occupying 95% of the land in rural areas, raising questions about the ecological, social, and financial feasibility of a corridor.

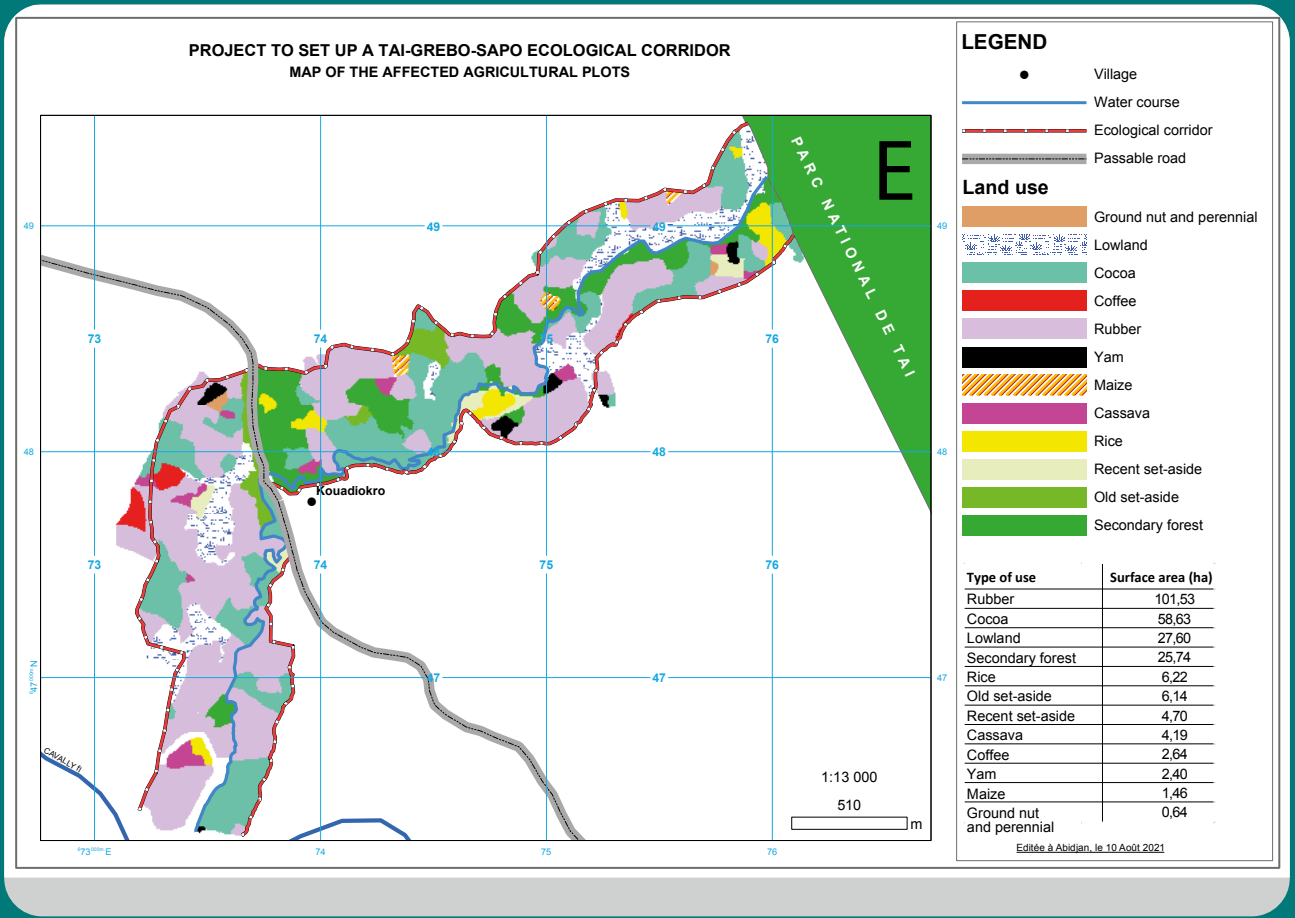


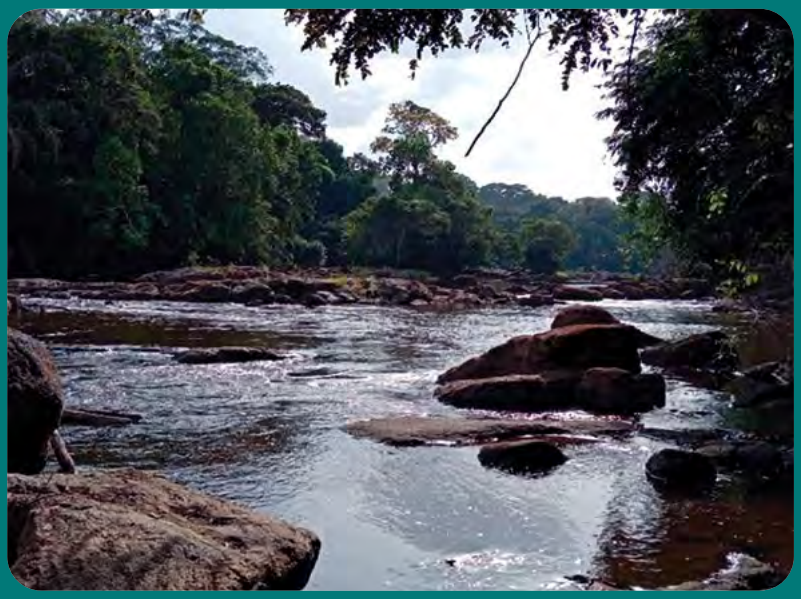
Image 2
A study carried out between 2017 and 2019 as part of the MINEDDTE-KfW project validated the creation of a woodland corridor along the Saro River, 3 km southeast of the town of Taï, between the Taï and Grebo-Krahn NPs.

At the start of 2020, the communities that own the area (89 % of 236 ha was initially occupied by crops and fallow land along the 4 km between the boundary of the Taï National Park and the Cavally River) were involved in the setup of the corridor, which included the assessment of the terms of compensation for the change in land use, as well as a participatory process for defining the boundaries of the future corridor. The corridor is now taking shape on the Ivorian side, with a Corridor Management Committee and the official request for the creation of a voluntary natural reserve (RNV) submitted in April 2022 to the ministry responsible for the environment (MINEDDTE).

Image 3 (overleaf)
Following agreements and compensation to those affected by the project in April 2023, the EU-PAPFor TGKS project has begun actions to secure the corridor, initiate its development and, above all, to put an end to further conversion for human activities pending its official classification as an RNV, as requested by the communities. These actions are being carried out by the three village associations responsible for its day-to-day management, set up in neighbouring villages, with the Corridor Management Committee as the umbrella structure and in conjunction with government stakeholders (EU PAPFor regional coordination, the OIPR and the departmental agriculture and forestry authority for the ministry of water and forests), the Taï commune and the prefectural authorities.

With a technical contribution from GIZ, the first management measures undertaken focus on the drawing up of boundaries by opening up paths and planting a line of kapok (*Ceiba pentandra*, Malvaceae), and forest restoration

SIDEBAR 25 CONTINUED...



←

Image 3
The Cavally River downstream from its confluence with the Saro River. The Grebo-Krahn National Park is in the background. (© GIZ)

within the corridor. Initially, thinning is being carried out in rubber tree and cocoa plots to open up the undergrowth and encourage the development of existing natural species. It should be noted that a detailed floristic inventory carried out in early 2023 identified the presence of 235 plant species eaten by large mammals (elephant, monkeys, including chimpanzees, duikers, pygmy hippopotamus, etc.), which constitutes an asset. The communities are also considering introducing native species of fruit trees for human and wildlife consumption: makore (*Tieghemella heckelii*, Sapotaceae), wild mango (*Irvingia gabonensis*, Irvingiaceae), akpi (*Ricinodendron heudelotii*, Euphorbiaceae), etc.

To develop the corridor's concept, the choice of target wildlife species (species under whose ecological requirements many other species will find themselves using and following the corridor) focused on:

- three primary species: forest elephant, pygmy hippopotamus and Diana monkey;
- four secondary species: dwarf crocodile, Jentink's duiker, chimpanzee and white-breasted guinea fowl.

These measures will be developed in a simplified management plan as required by the RNV status, in which the provisions relating to surveillance, rules of use, management of foreseeable human-wildlife conflicts in the surrounding area, etc. will be put forward in a participatory manner.

Measures to support good agricultural practice (including agroforestry) and the development of IGAs, particularly those based on the sustainable management of natural resources, will be implemented in the villages bordering the corridor.

Finally, although the creation of a corridor along the Hana River was not approved for 2019, an effort has been made to restore forest vegetation along its banks, with the cessation of all cultivation along a 25 m wide stretch and the intensification of cocoa-farming practices as compensation. Even in a discontinuous way, this will contribute to ecological connectivity.

Vincent Beligné, Advisor on Forests, Agroforestry and Environment for PAPFor-TGKS project

First delivery of improved honey in the Pinselli-Soyah park in Guinea, one of the activities supported by the PAPFor programme. (© M. Languy)

As outlined in Section 2.4 regarding threats, various voluntary initiatives enable companies to transition towards environmentally, socially and economically sustainable practices. Relevant certification schemes guarantee sustainability, 'deforestation-free' production, wildlife conservation and supply chain transparency. Ideally, the use of 'premium' selling prices helps support those involved in these initiatives.

The results of these market-based initiatives have been encouraging in some concessions, particularly in limiting deforestation and thus contributing to the creation of buffer zones and ecological corridors when these concessions are adjacent to protected areas. However, their effects on reducing wider pressures are less certain.

One of the main weaknesses of this approach is that it is not well suited to local producers or producer organisations, which limits their development potential. Systems that are more accessible to smallholders are currently being considered. Furthermore, it is common that the companies and organisations involved in these certification processes already implement environmentally and socially conscious production methods. To encourage the sustainable management of natural resources among companies that are less aware of environmental issues, the development of partnerships with the private sector based on the outskirts of PAs, initiated by the implementing agencies and authorities responsible for protected areas, should be supported.

5.3 PUBLIC-PRIVATE PARTNERSHIPS

In the 1990s, the World Bank introduced the concept of PPPs to encourage collaboration between the public and private sectors.

Faced with a rapid decline in wildlife populations, the PPP concept was extended to the management of protected areas. In this case, it is not-for-profit organisations that collaborate with national authorities to improve the management of PAs by providing financial and technical support with, where possible, a delegation of management in the medium or long term.

These PPPs provide the managing partner with a stronger, clearer mandate within a defined timeframe, independent decision-making, and greater administrative and financial flexibility.

African Parks Network (APN) has been a pioneer in the use of PPPs for the management of PAs in Africa. This model, which is starting to be replicated, is based on three pillars (known as the 3Ms):

- A clear mandate (Mandate): governments retain ownership of the parks and determine their political direction. The partner is responsible for the management. These conditions are set out in long-term agreements (10 to 20 years, or longer).
- Financial resources (Money): the partner commits to finding financing solutions for the protected area and to ensure the transparency of the budgetary process.

SIDEBAR 26 PAYMENTS FOR ECOSYSTEM SERVICES, CARBON CREDITS AND BIODIVERSITY CREDITS: (NEW) FINANCIAL OPPORTUNITIES FOR PROTECTED AREAS

To date, the effects of PES schemes have been inconclusive. They depend very much on the context in which they are implemented. On a global scale, the impact of PES on reducing deforestation remains weak.

Carbon credits

Derived from the PES mechanism, the reducing emissions from deforestation and forest degradation (REDD) programme was developed in line with the Paris Agreement. The REDD concept was then broadened to REDD+ in order to include forest restoration and reforestation activities.

The REDD+ mechanism negotiated under the UNFCCC enables payments from developed countries to developing countries in return for the latter reducing their greenhouse gas (GHG) emissions resulting from forest loss or increasing forest carbon stocks.

This mechanism requires a lengthy step-by-step process: (i) preparation, which consists of identifying the drivers of deforestation and forest degradation and developing a national REDD+ strategy; (ii) implementation, during which the necessary skills are built up and pilot projects are developed; and (iii) financing, when actions are implemented on a large scale, with emission reduction measurements and monitoring, enabling the receipt of payments for the carbon stored. A reference level of carbon stock is estimated during the preparation phase. The national approach is one of the criticisms levelled at REDD+: local populations are asked to make efforts when they themselves cannot be direct beneficiaries of the funds.

For more information regarding REDD+ in the countries of the Guinean forests:

- For Côte d'Ivoire: https://redd.unfccc.int/submissions.html?country=civ and https://reddplus.ci/category/strategie-nationale-redd-cote-divoire/
- For Ghana : https://redd.unfccc.int/submissions.html?country=gha
- For Liberia : https://redd.unfccc.int/submissions.html?country=lbr
- For Nigeria : https://redd.unfccc.int/submissions.html?country=nga

Although Sierra Leone produced a concept note for its REDD/REDD+[a] implementation strategy in 2010 and its Nationally Determined Contribution (NDC) was updated in 2021[b], its carbon stock reference level has not yet been validated at the national level. However, as mentioned above, a carbon credit programme is in place in the Gola Rainforest National Park and is generating revenue that covers approximately all of the management costs of the national park, a unique case in West Africa.

Guinea, on the other hand, is less advanced. It is in the preparation phase with the finalisation of its national strategy and action plan on climate change. It has not yet received any major funding from the carbon credit market.

The impacts of REDD and REDD+ initiatives appear to be moderate in terms of CO_2 emission reductions and forest conservation, and are far less encouraging in terms of contribution to the well-being of local populations. The financial flows involved are still small, and scaling up from pilot projects to financial transactions on international markets is proving slow and complex.

FIGURE 27 Conceptual diagram of how biodiversity credits work (adapted from Organization for Biodiversity Certificates, 2022).

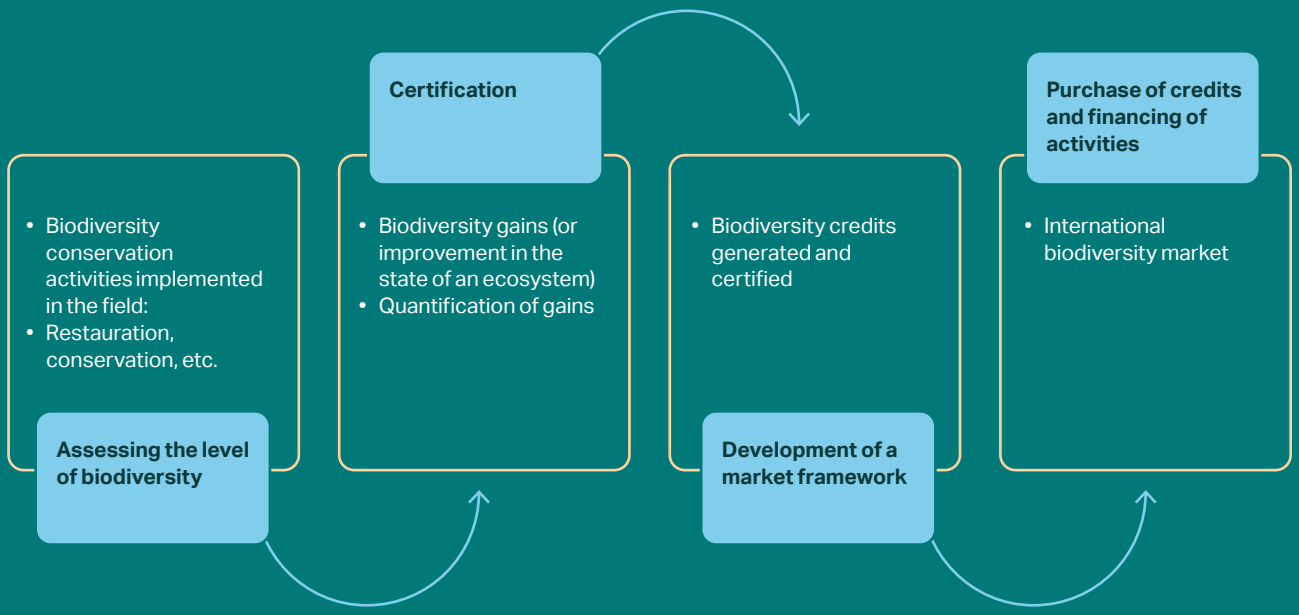


Figure 27
Conceptual diagram of how biodiversity credits work (adapted from Organization for Biodiversity Certificates, 2022).

Biodiversity credits

Like carbon credits, biodiversity credits are a conservation finance mechanism based on the creation of a credit associated with an investment in the conservation of a given landscape or protected area. This investment is used to implement actions to restore, protect or promote biodiversity. The asset can then be purchased by companies seeking to fulfil their environmental, social and governance (ESG) commitments. The financial value of the asset must be assessed, for example, on the basis of the progress made as a result of the conservation actions in terms of the general health of the ecosystem or the population size of a target species within the territory.

To make this mechanism active and effective, a standard system for measuring, monitoring, verifying and certifying credits is essential. Appropriate legislation and policies must be put in place to enable and facilitate the creation of a biodiversity market. Transparency is another essential part in the operation of this mechanism. At this stage, standard measurement and monitoring systems and legislation do not yet exist for Guinean forests, although methodologies are being developed (e.g. Plan Vivo, Organization for Biodiversity Certificates, etc.).

a) See https://www.globalsupportprogramme.org/sites/default/files/downloads/seirra_leonneredd_strategy.pdf
b) See https://unfccc.int/sites/default/files/NDC/2022-06/210804%202125%20SL%20NDC%20%281%29.pdf

Preparing tourism logistics in the Gola Rainforest National Park, Sierra Leone, where a PPP has been set up. (© M. Languy)

- Good governance (Management): these PPPs involve setting up separate legal entities registered in the host country (often national foundations) and a board of directors representing the main stakeholders that meets regularly (once or twice a year). In the most successful cases, representatives of local communities sit on this board.

In West Africa, there are few PPPs set up for the management of protected areas, and none in forest areas. However, initiatives are starting to emerge, highlighting the potential of this innovative approach to address the challenges of conserving and managing protected areas in the region. The PAPFor and NaturAfrica programmes support the sharing of experiences from various PPPs in order to study the potential for multiplying this approach, where it could be relevant.

One initiative based on the PPP approach within PAPFor/NaturAfrica forest landscapes was the one developed in the Gola Rainforest National Park in Sierra Leone. A management entity has been set up, the Gola Rainforest Company limited by guarantee (GRC-LG), whose board of directors includes the main governmental, local and international stakeholders. The GRC-LG is tasked with managing the national park and, in particular, the income from carbon credits generated by the park and a 4 km buffer zone ('leakage belt').

As part of a landscape approach, PPPs with properly managed industrial operations can considerably enhance connectivity between PAs, particularly when adjacent to a well-managed one. Thus, for example, a sustainably managed forest concession, provided it meets the necessary requirements (*see Chapter 2, Sidebar 11: Taking wildlife into account in forest concessions*), can extend biodiversity protection beyond the PA and be an important contributor to the establishment of forest corridors. Given the significant environmental impact of industrial activities, as well as the financial potential held by certain companies, this type of collaboration should be encouraged. The private sector's financial commitment to conservation can also be encouraged through their participation in carbon and biodiversity credit markets, the introduction of

Meeting with local leaders on the PAPFor programmintheWologizi-Wonegizi-Ziama landscape in Liberia and Guinea. (© M.Languy)

compensation measures, or payments for ecosystem services (PES), although the impact of these measures is still to be seen.

PPP agreements are effective and enable, in the long term, the management of large areas (or even landscapes) by meeting the needs of the various stakeholders (conservation and socioeconomic development). However, they require lengthy negotiations between private sector players, conservation organisations and governments before an agreement can be reached and the planned actions launched.

The establishment of multi-actor consultation platforms involving the stakeholders of a PA's landscape has proved its worth in Central Africa, and this concept could be transposed to West Africa. Setting up these platforms requires strong communication, collaboration and coordination between the various stakeholders (communities, customary authorities, local administration, etc.) as well as between the different sectors and levels of governance.

5.4 COLLABORATION WITH INDIGENOUS PEOPLES AND LOCAL COMMUNITIES

Working with IPLCs around protected areas and promoting sustainable management of natural resources is an essential issue, but also a particularly sensitive one. Local communities that find real interest in PAs, particularly through financial or development benefits, will protect them from unsustainable exploitation.

The initial management strategy for PAs, which consisted of imposing a conservation-based management method on local populations, has now been replaced by community involvement through several fundamental stages. These are as follows: i) identification of the customary rights holders; ii) identification of all the stakeholders; iii) obtaining consent; iv) sharing decision-making power by electing representatives to sit on the decision-making bodies; v) mechanism for sharing the annuity (benefits) from the PA; vi) implementation of income-generating activities; and vii) priority access to employment in the PA.

SIDEBAR 27 COMMUNITY SURVEILLANCE TEAMS IN LIBERIA

At the request of local communities to be more involved in national park conservation in Liberia, the FDA and its partners have set up community watch teams (CWTs) made up of village chiefs, women leaders and youth representatives. These teams patrol the boundaries of the park to monitor penetration and provide information on the current rules. In collaboration with the FDA, offenders are arrested, and mining and hunting camps are destroyed.

In a similar way, a community eco-guard programme is being developed in the Grebo-Krahn National Park (also Liberia). Teams of community eco-guards are responsible for documenting and preventing human incursions into the park's boundaries, and associated illegal activities. Members of the community teams are trained to use a Global Positioning System (GPS) and SMART software to collect geo-referenced data. This programme has demonstrated positive results in terms of empowering and building women's capacities. It has also led to the development of a strong environmental awareness within the communities involved, and a decrease in illegal activities and bushmeat consumption.

Today, particular attention is paid to recognising and securing the land rights for local populations and indigenous peoples, and to guaranteeing their right to the use of natural resources within and around PAs. However, these measures in no way prevent the prohibition of certain activities that are detrimental to the maintenance of the integrity of the protected area (commercial hunting, in particular). Some protected areas are, either as a next step or as soon as they are created, also owned and managed by IPLCs. In this case, it is the rules that they themselves draw up, in compliance with the specific legislative framework, that will ensure conservation.

On the ground, participatory, inclusive and representative approaches are adopted to meet the expectations of the whole community, not just those of a few dominant elites. Although participatory management is not a universally appropriate response, it is particularly effective in areas where forestry governance is weak and governments struggle to enforce the law.

Depending on the context and the needs expressed by IPLCs, collaboration can take different forms, such as sharing the benefits of conservation, rural development interventions, support for the development of sustainable value chains, or even improved management of human-wildlife conflicts, community forestry in local zones, etc.

As highlighted above, EU initiatives through PAPFor and NaturAfrica use conservation activities as an entry point for land-use planning and support for sustainable development.

However, community management of natural resources is far from being a single, universal solution. Related to the issue of land status and land rights, community management is also linked to demographic growth (a growing population that has to share resources in a limited space) and leaderless social structures in certain forest countries, which makes mobilising around a common resource complex. Finally, the fight against poverty among people living near PAs in West Africa cannot be based solely on conservation projects and must be tackled in a wider way by governments and specialised agencies.

SIDEBAR 28 DEVELOPMENT OF BEEKEEPING TO IMPROVE THE WELL-BEING OF COMMUNITIES SURROUNDING CERTAIN PROTECTED AREAS

← *Training in beekeeping techniques in Outamba NP. (© WCF)*

A PPP involving the FDA, the WCF, Liberia Pure Honey, Universal Outreach Foundation, and 23 local communities on the outskirts of the Grebo-Krahn National Park (Liberia) was established in 2017. The objectives of the project are to develop beekeeping as a source of income and to promote agroforestry practices to help preserve forest cover. By the end of 2023, 223 beekeepers had been trained to manage 421 hives around the park, and are also helping to protect the remnant forests outside the park. As well as selling honey, households use it for their own consumption, whether for food or medicinal purposes.

Two local communities were also trained in beekeeping on the outskirts of the Gola Rainforest (Sierra Leone) and Gola Forest (Liberia) National Parks, in order to provide a sustainable IGA compatible with conservation.

A similar approach has been developed by WCF in the OKKPS landscape, with two beekeeping support programmes set up near the Soyah Reserve (Guinea) and Outamba National Park (Sierra Leone). On the outskirts of Outamba, two beekeeping cooperatives, Kothor and Yembere, have been set up and have received training in beehive management and monitoring practices and in sustainable honey production. Twenty members of the beekeeping cooperatives, including 11 women, gained a better understanding of the sector, focusing on four themes: (i) criteria for choosing and selecting a beekeeping production site, (ii) techniques for managing and monitoring hives, (iii) the production of improved honey from Kenyan hives, and (iv) methods for harvesting hives and processing honey.

5.4.1 INCOME-GENERATING ACTIVITIES

This approach aims to compensate for the restricted use of natural resources in conservation areas. A number of sectors have been trialled to provide alternative income for IPLCs living close to conservation areas. Among these, beekeeping, market gardening, the exploitation of NTFPs, subsistence farming, and support for agroforestry cash crops (particularly cocoa) have shown good results. Activities that contribute to food security are particularly relevant in these contexts. Social and community forestry, which is less often supported, also represents an opportunity.

Currently, most trade in NTFPs takes place at community level, with the exception of certain niche products. The development of these sectors presents an opportunity to boost the incomes of local populations in a sustainable way. For example, the butter extracted from the seeds of the makore tree (*Tieghemella heckelii*, Sapotaceae), similar to those from the shea tree, is used by communities living near the Taï National Park in Côte d'Ivoire and is a NTFP that can be used in the cosmetics industry.

Unveiling of a building for processing makoré oil, which is used locally as oil for cooking or seasoning, financed by the PAPFor programme with GIZ in the Taï National Park, Côte d'Ivoire. (© M. Languy)

Similarly, in the Cross River landscape, support provided to communities neighbouring the national park to collect wild mangoes has significantly reduced pressure on the forest while increasing household incomes. Support can be provided for processing, packaging, storage and marketing activities with the aim of increasing the added value paid to producers. Support can also be provided for the creation of cooperatives or producer groups, who facilitate economies of scale and market access, as well as the sharing of knowledge and skills between producers. It should be noted that collective approaches are not always miracle solutions, as single household- and producer-based approaches may be better suited to the socioeconomic context.

As well as improving the standard of living and incomes of IPLCs, the development of IGAs and agricultural value chains represent a good opportunity to train producers in sustainable practices. Typically, promoting agroforestry, agroecology (a systems approach to agriculture), or conservation agriculture, which involves minimum tillage, is a way of supporting producers, reducing their expenditure and dependence on external markets (chemical fertilisers and pesticides, for example), and sometimes increasing or diversifying their production or even increasing the value of their products (organic or fair-trade certification). Involving IPLCs in development initiatives on the outskirts of protected areas and in biodiversity conservation initiatives does, however, entail certain risks such as power grabs by certain elites, changes in the attitudes and priorities of IPLCs over time, or extreme external pressure influencing their decisions. Some NTFP supply chains are also based on 'extractivism', i.e. the exploitation of a non-domesticated spontaneous resource from the forest. In this case, there is an obvious risk of over-exploitation of this resource if the resulting trade is too intensive. This approach presents a number of challenges, particularly the need to develop collective skills and practices and to ensure regular production, in both quality and quantity, to meet market requirements. It also requires building an extraction and transport system in areas that are often isolated.

A final challenge concerns the impact of such support programmes on the biodiversity of protected areas. The assumption behind these programmes is that, in parallel with the support, communities will reduce, or even stop, any illegal and/or unsustainable activity within protected areas. Unfortunately, poaching or encroachment often continues unabated. One solution promoted in certain programmes, such as the WCS programme in Cross River, is to establish contracts with the communities, in which the latter's commitment to stopping illegal activities within the PAs is a condition for continued technical and financial backing from the support programmes.

Using an interactive model to map an area. (© Nature+)

SIDEBAR 29 THE INTERACTIVE MODEL, AN INNOVATIVE PARTICIPATORY MAPPING TOOL

Why a participatory approach?
Adopting a participatory approach creates the right conditions for the emergence of a development dynamic at the local level.

The interactive model
The interactive model stands out as an innovation among participatory planning tools, offering a solution that can be adapted to a range of natural resource management issues. Made up of painted wooden elements, this modular relief map offers a miniature representation of the village and the land, fostering communication and stimulating reflection.

Use of the interactive model
Using the interactive model helps kick-start a shared process of awareness raising around the availability of natural resources in the area. Within the community, participants share their ideas to reach a common vision of the current situation. From this collective awareness a process will emerge for identifying solutions and concrete actions to be implemented in order to guarantee the sustainability of the forest and the ecosystem services it provides.

The aim is to get participants to identify the differences between the past and the present regarding the evolution of the forest areas in their region. The aim is also to understand the causes and consequences of these changes and to imagine a common future for the management of these areas.

The process begins with participants reproducing their village and their land using elements that represent the landscape. The elders are then invited to superimpose the village of the past, characterised by houses and trees of different colours, onto the present. This spatial reconstruction is completed with labels illustrating the products of the forest, highlighting the collection centres of yesterday and today.

The whole community is then encouraged to identify the differences between the past and the present, and to discuss the causes and consequences of these disparities. A debate emerges over the loss of many goods and services linked to the pressure exerted on the forest area that led to its decrease. The community is then invited to remove from the fabric all the trees and associated services (gathering, hunting, etc.) that have disappeared, forming a pile on the side. In just a few minutes, this process provides a simulation of the exploitation that has taken place over the last few decades.

The event ends with the solutions imagined by the community to rebuild their forested area and thus project itself into a ‘possible village’. This sequence launches the debate on where actions are to be taken.

Cecilia Julve Larrubia, Director, Nature+

Women from one of the villages inside the future Pinselli-Soyah-Sabouyah National Park in Guinea take part in a participatory mapping exercise. (© Wild Chimps Foundation)

5.4.2 OTHER RURAL DEVELOPMENT INTERVENTIONS

MAPPING USAGE RIGHTS

In order to guarantee the eventual recognition of customary rights, and to put in place appropriate management measures, the customary use of space and the various land uses surrounding protected areas are mapped in a participatory manner with the involvement of village communities. Sacred sites, ancient villages, and hunting and gathering areas are surveyed and geo-referenced in accurate detail for each village, in close collaboration with the customary authorities and village communities.

Participatory mapping can be the first step in an in-depth reflection on land-use planning. It can be used to identify areas most prone to plantation raiding by wildlife or to work with local communities to identify ecological corridors linking protected areas. In line with the principle of free, prior and informed consent (FPIC), a change in land use within their territory can be considered with the local population.

MENTORING

The mentoring approach is starting to be applied in the context of supporting socioeconomic development in and around protected areas, particularly as a means of combating poaching. The term refers to a traditional system for passing on knowledge and training in a trade, based on a mentor or a community of experienced craftspeople. The aspiring trainee, often a young person with few qualifications, is trained in a trade through a series of educational practices: learning by doing, theoretical school programmes, roaming education, etc. The field of training chosen by the candidate may be linked to the management of the protected area or relate to existing trades in the vicinity or in urban centres, linked to tourism, etc.

The idea is to get the candidate out of a mindset of dependency on natural resources (e.g. hunting) and to offer them nothing less than a new career and life path. The training is also an opportunity to raise the young person's awareness of the issues relating to conservation. Remuneration is paid to the trainee and the trainer. Unlike the development of IGAs and the sharing of benefits from conservation, mentoring has the advantage of being able to target young people and open them up to employment opportunities.

Mentoring is also applied at the level of civil society organisations, with the aim of strengthening the capacities of an emerging or weaker organisation through the support of an established organisation. This approach is particularly favoured by the Critical Ecosystem Partnership Fund (CEPF) for projects funded in the biodiversity hotspot of the Guinean forests and has produced encouraging results.

The wildlife sanctuary on Tiwai Island in Sierra Leone is managed through collaboration between conservation agencies and local communities. (© M. Languy)

5.4.3 THE CO-MANAGEMENT OF PROTECTED AREAS

Co-management of protected areas refers to a type of partnership in which all interested stakeholders agree to share management functions, rights and responsibilities over a portion of territory or a range of resources. This definition therefore implies the recognition of the legitimacy of local communities over the area they have occupied for a long time, as well as their involvement with other stakeholders (various government departments, civil society, etc.) in decision-making, the sharing of annuities and benefits, IGAs and priority access to employment. Management is described as 'community-based' when it relies on local communities as the main social unit.

The most advanced stage of collaboration with local communities relates to their practical involvement in the management of the protected area and its resources: community-based conservation (CBC) or community-based natural resources management (CBNRM). In some cases, this co-management is achieved by slowly changing a standard model of state management. In other cases, this (co-)management is carried out as early as the boundary-setting and classification stage of the PA, in partnership with a conservation authority or autonomously.

The founding theoretical premise behind this co-management of natural resources is based on the idea that empowering communities would make it possible to reduce or even stop illegal and/or unsustainable activities, since IPLCs would benefit directly from the conservation of resources and would therefore be encouraged to preserve them and use them sustainably. In this case, it is the rules drawn up by the IPLCs local to or bordering the PA, in accordance with a national legislative framework (sometimes adapted locally through a management plan), that will ensure conservation.

In the context of the co-management of PAs, and in particular of community management, the legitimacy of local populations to manage the natural resources of their ancestral lands should be legally recognised. This recognition is achieved through the delegation of ownership or management rights over the PA and of the resources it contains by the decentralised powers of the state towards the communities. The state may, however, retain a more or less important regulatory and supervisory role, and support the communities in their management. When a management authority is involved with IPLCs, principles of joint management must be built by incorporating local and traditional knowledge and the results of scientific research.

This support is essential, as traditional knowledge and practices – generally built up at times when human population densities and the threats to forest ecosystems were much lower – are no guarantee for the sustainability of resources and their use. Ideally, a system for

SIDEBAR 30 FROM COLLABORATION TO CO-MANAGEMENT, THE CASE OF THE EAST NIMBA NATURE RESERVE (LIBERIA)

For several decades, many conservation programmes have realised that PAs cannot be managed without the support of local communities. Indeed, following the first paradigms of conservation intervention in PAs for the good of communities, new approaches are aimed at conservation with or even by communities. This is how protected area co-management systems have been set up.

Within the PAPFor and NaturAfrica programme, the East Nimba Nature Reserve (ENNR) in Liberia is an example of co-management.

The ENNR was created in 2003 as a strict nature reserve. With a relatively small surface area (11.5 km²), it is surrounded by numerous villages and has been subject to strong human pressures since its creation. In order to find solutions that suit everyone and to include local communities in the management of the reserve, a Co-Management Agreement (CMA) was drawn up in 2010 between the FDA and the local communities, represented by a Joint Community Forest Management Body (JCFMB) for the Sehyi, Gba and Zor communities.

Management of the reserve is entrusted to an ENNR Co-Management Committee (CMC). This committee has 12 members, including six representatives from the FDA and six from the JCFMB. After the CMA first expired in 2016, the FDA and the CMC renewed the agreement, allowing the communities and the FDA to continue managing the reserve.

This agreement was revised in October 2022 in order to strengthen the coordination between the partners supporting the reserve. The main revisions to the original CMA include clarifications regarding the operational structure of the CMC, the rights and obligations of the committee and the FDA, and financial transparency. In parallel, the PAPFor programme, with the support of the United Nations Office for Project Services (UNOPS), has supported the development of a new management plan, which was validated in September 2024, following close work with the CMC.

participatory monitoring of the condition of the PA and its resources should be developed and implemented, so that communities can adapt their management measures according to their effectiveness. One of the challenges of the development of community (co-)management is that the devolution of rights to IPLCs is not always legally provided for. A favourable legislative framework and suitable support systems are therefore prerequisites for the development of management initiatives led by local people. These initiatives should not aim to replace all conventionally managed protected areas, but rather to complement them.

The (co-)management of PAs by local communities can take place in several stages, allowing a gradual devolution of rights and responsibilities to IPLCs. To achieve this, targeted support from development and conservation NGOs can be established to strengthen the capacities of the local management structure and gradually train it to manage the PA responsibly and effectively. As the devolution of rights is conditional on the IPLCs acquiring specific skills, it is achieved gradually.

Ideally, the participatory identification and mapping of natural resources and their uses by IPLCs is carried out right from the start of the process of defining the PA (in compliance with FPIC) (see Sidebar 29: The interactive model: an innovative participatory mapping tool). Based on the results of this process, the use of natural resources by local populations is regulated through the participatory establishment of access arrangements. In the event of usage restrictions, IPLCs define appropriate financial or material compensation.

It is important to stress, however, that the co-management (more or less community-based) of natural resources is far from being a single, universal solution. It comes up against a number of difficulties, such as the lack of defined rights

Children taking part in the activities of Club PAN, an environmental education programme supported by the EU-funded PAPFor Programme and implemented by the Wild Chimpanzee Foundation (WCF) in the Outamba-Kilimi-Kuru Hills-Pinselli-Soyah (OKKPS) transboundary forest landscape between Sierra Leone and Guinea. (© WCF)

for rural populations over resources, and the resulting lack of interest in ensuring their sustainability ('tragedy of the commons'). Problems with representation also quickly arise in this type of system, with 'average' villagers feeling out of touch with their representatives or suspecting certain parties of monopolising management.

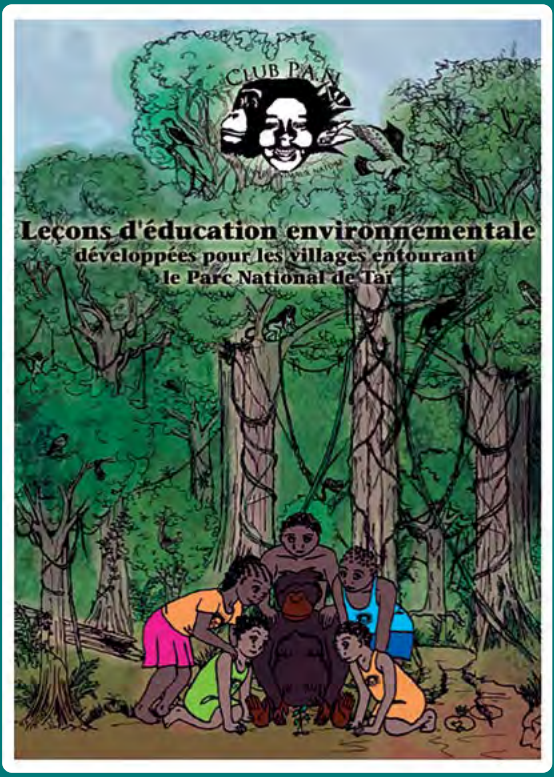
It should also be noted that community management cannot be divorced from the problem of human demographic growth (a growing population having to share limited space and resources) and a highly individualistic conception of life in some forested countries, which sometimes makes it difficult to organise around joint management. We should also mention the frequent conflictual nature of this type of approach, where areas of co-management of natural resources are turned into an arena for clan, lineage or local political disputes. Lastly, there is the structural problem of poverty among African populations, and West Africa in particular, which impedes all community initiatives in that it sometimes leads to the misappropriation of funds. It should be remembered that resolving this endemic poverty must never be the sole responsibility of conservation projects, but must be tackled on a much wider scale by governments and specialist agencies.

5.5 ENVIRONMENTAL EDUCATION, AWARENESS-RAISING, OUTREACH AND COMMUNICATION

Environmental education, community awareness-raising, outreach and communication around conservation issues are approaches that aim to inform people living around PAs and, on a wider scale, the general public, with the aim of bringing about both behavioural changes and the adoption of more sustainable practices. Highlighting the link between forest conservation and the ecosystem services that forests provide helps to increase the level of public support for PAs and their associated activities.

Communication strategies utilising creative media (films, plays, role play, comic strips, radio broadcasts, social media, etc.) are effective communication tools and encourage enthusiasm among IPLCs. They can sometimes also help the evolution of the institutional and legislative context by influencing government decisions.

SIDEBAR 31 ENVIRONMENTAL AWARENESS-RAISING ACTIVITIES IN TAI NATIONAL PARK (CÔTE D'IVOIRE)

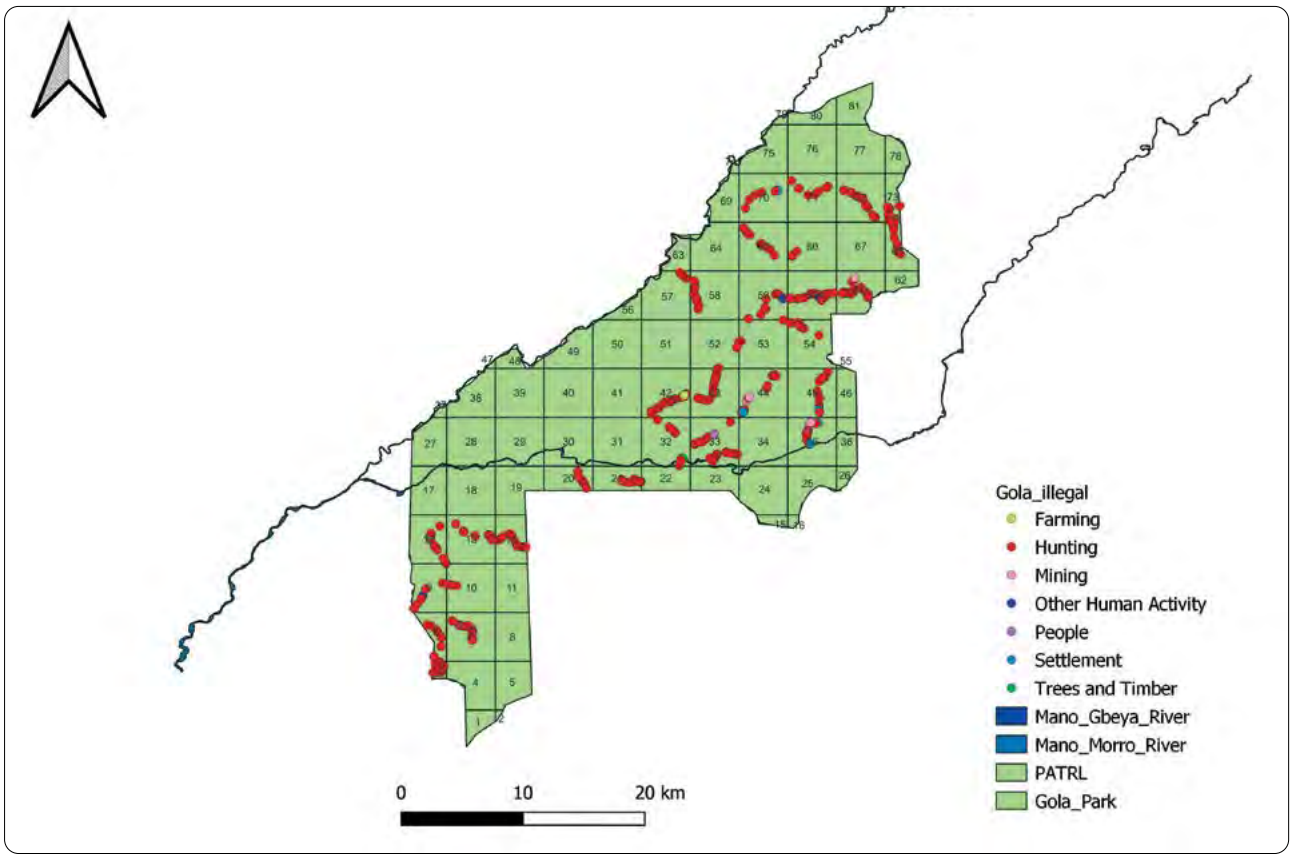


Cover of Club PAN's environmental education manual. © Max Planck and WCF

The Wild Chimpanzee Foundation (WCF) was set up in 2000 to protect the West African chimpanzee population in the Taï National Park. With the aim of combating illegal activities and reducing hunting pressure, WCF has set up an awareness-raising programme consisting of either a play, dealing with the coexistence between chimpanzees and human populations, or the screening of a film, each followed by a debate with the public. In addition, an environmental education programme for schools, Club PAN, has been set up. This approach has also been implemented on the outskirts of the Gola Rainforest National Park (Sierra Leone) and the Gola Forest National Park (Liberia), along with beekeeping training for two communities, as a sustainable income generating activity (IGA) compatible with conservation.

These activities were implemented between 2005 and 2015. The impact of the programme was assessed over several years by monitoring bushmeat consumption in the participating villages. The resulting data analysis showed that the more households took part in environmental awareness-raising activities, the less bushmeat they consumed. This case study is a good illustration of how appropriate, long-term educational and environmental awareness-raising activities can lead to changes in behaviour and promote the conservation of forests and their wildlife. Club PAN is still active today in Guinea within the Pinselli-Soyah-Sabouyah landscape.

FIGURE 28 SMART map showing illegal activities in Gola Forest National Park, Liberia (Oct.-Dec. 2023)



5.6 MONITORING AND RESEARCH

With the acceleration of changes to protected areas both internal (habitat alteration, epidemics and emergence of diseases, destruction of forest cover, etc.) and external (climate change, changes in land use around protected areas, etc.), it is necessary to implement programmes to monitor the state of protected areas in order to assess the effectiveness of management and conservation measures, and to develop appropriate responses in cases where management objectives are not being met.

Among the various tools used in many protected areas and several OECM zones is the SMART tool[18]. SMART allows for the facilitation and standardisation of collected data on human activities (initially) and the presence of animal species. The data is encoded directly in the application, installed on a smartphone, and connected to a GPS. The use of SMART makes it possible to automate the analysis and reporting of data collected by surveillance and anti-poaching patrols, and to easily identify the 'hotspots' where human pressure is highest and where patrolling efforts need to be heightened. When two contiguous sites use the system, they can exchange information and decide in which areas they should pool and concentrate their efforts for landscape-wide management.

The IMET is one of the other tools that can facilitate the monitoring of PAs and the effectiveness of their management at scale (See Chapter 3, Sidebar 17: IMET: a tool for the monitoring and assessment of protected areas).

In addition to monitoring efforts, applied research is an essential component of the management of protected areas (and their surrounding areas). It can be integrated into a wide range of themes, including the study of ecosystems, communities and species, and in particular their reaction or adaptation to anthropogenic and natural pressures. Applied research provides an opportunity to assess the impact of different management measures, and even propose innovative approaches to conservation. These research activities can be developed directly by the entity responsible for managing the protected area, where a 'research and monitoring' team exists, or through a partnership with universities and other research institutions. In the latter case, it is important that the PA has drawn up a document setting out its research priorities, so that the research carried out in the protected area aligns with the interests of the managers.

18 https://smartconservationtools.org/

A training course was held in Monrovia in September 2023 in using a tool for analysing the management of community forests and other community-managed conservation areas, adapted from the IMET tool by the PAPFor programme with support from other EU-funded initiatives. (© PAPFor)

SIDEBAR 32 ADAPTATION, TESTING AND TRAINING IN THE USE OF IMET FOR COMMUNITY FORESTS AND OTHER COMMUNITY-MANAGED CONSERVATION AREAS

IMET is a tool that can be used to monitor the effectiveness of PA management and identify support needs to improve it.

Considering the development of OECMs and particularly of community forests, the PAPFor programme, BIOPAMA and the European Commission's JRC have developed a version of IMET for OECM conservation areas.

The first stage was the development of the digital tool with technical support from the JRC, which was completed in early 2023. The second stage consisted of two field tests, in March and April 2023: in collaboration with the Royal Society for the Protection of Birds (RSPB) and the Conservation Society of Sierra Leone (PAPFor's implementing agencies in the Gola Landscape), two IMET-OECM assessments were carried out in the community forests adjacent to the Gola Rainforest National Park in Sierra Leone.

Based on this field test, the IMET-OECM tool was adjusted and is now available in its final version.

This initiative came to a close in September 2023, when the PAPFor regional coordination organised a training course in Monrovia for 13 practitioners from Guinea, Sierra Leone, Liberia, Côte d'Ivoire and Nigeria.

The participants, from PA administrations and PAPFor implementing agencies, were already familiar with IMET and underwent an intensive programme on this module adapted for OECMs.

In addition, participants identified potential areas for IMET-OECM assessment in each of the six PAPFor West African forest landscapes. For some landscapes, these assessments could be scheduled as part of the new EU-funded regional programme, NaturAfrica.

SIDEBAR 33 CONSERVATION IN THE TAÏ – GREBO-KRAHN – SAPO LANDSCAPE: AN EXAMPLE OF COMBINING APPROACHES

A snail farm, called an 'achatinerie', at Daobly on the outskirts of the Taï National Park, Côte d'Ivoire, and achatines ready to be introduced into crates for breeding. (© V. Beligné)

From 2015 to 2025, as part of the biodiversity conservation support work in the TGKS landscape provided by co-financing from the German development agency[a] and the European Union (PAPFor – TGKS), several approaches were used to support the sustainable management of the three protected areas in Côte d'Ivoire and Liberia.

From the outset, this support was part of a drive for transboundary cooperation led by the bilateral steering committee set up for this collaboration by all stakeholders and which, in 2023, held its 7th meeting in Monrovia.

First of all, the support given includes direct initiatives, such as assistance for the classification of the Grebo National Forest into the Grebo-Krahn National Park (ongoing since 2017, using a participative approach to define the boundaries). This park is the first link in the connectivity chain between the Taï and Sapo National Parks, connectivity that is planned in practical terms through the creation of physical corridors (at least 450 m wide) or in a more abstract manner through the maintenance or restoration of forest cover on the periphery of these corridors (see sidebar 25 on the Taï corridor).

In terms of support for the management of PAs, assistance is provided for its development (annual operational planning for the Taï National Park, participatory design of the development and management plan for the Grebo-Krahn National Park). Training in innovative management tools such as IMET and SMART has also been provided in both countries, as part of basic training (Liberia) or in-service training (Côte d'Ivoire). Support for the monitoring of the Grebo-Krahn National Park and the Cavally Nature Reserve (classification recently upgraded) in partnership with the international NGO Wild Chimpanzee Foundation (WCF) is underway to strengthen the protection of these two ranges, which are also adjacent, connected via the Cavally River.

As an important factor in the success of efforts to manage protected areas sustainably, the development or support of co-management tools has not been overlooked, with the monitoring of the Local Management Committee (LMC) for the Taï National Park and the creation of Protected Area Management Advisory Committees (PAMAC) for the Grebo-Krahn National Park. For any activity or event, representation of local stakeholders is a prerequisite.

(*continued overleaf*)

SIDEBAR 33 CONTINUED...

On the outskirts of PAs, support is provided for the implementation of management plans, either for the maintenance or restoration of diffuse forest cover in the landscape, an element of ecological connectivity, or for local development, which helps increase acceptance by the communities of the efforts made to conserve biodiversity:

- The sustainable management of village, family or privately owned forests (through the creation of management committees, formalised statutes – into community forests or RNVs – and the development of simple management plans); this involves 14 villages in Côte d'Ivoire (for a total of 144 ha ranging from 1 to 53 ha per forest) and three in Liberia (identified in the common land-use plans).
- In conjunction with the conservation of natural areas and ecological connectivity on the one hand, and land-use planning in favour of local development on the other, participatory spatial planning has been, and still is, the subject of work using the MARXAN tool throughout the landscape, as well as in the official land-use planning process in Liberia's administrative districts.
- In partnership with the 'sustainable development' foundation of an economic operator in the cocoa sector, support for the restoration of forest vegetation on the banks of the Hana River and its tributaries by freeing the banks from all cultivation over a 25 m perimeter and increasing cocoa-growing practices as compensation (individual agreements with around 100 producers).
- The promotion of agroforestry, based on previous achievements (20 to 25-year-old plots of farmland and more than 1 000 mature forest fruit trees in the Taï department) and on the valorisation of their non-timber products, e.g. kplé fruit or wild mango (*Irvingia gabonensis*, Irvingiaceae), makore butter (*Tieghemella heckelii*, Sapotaceae); this also relies on the availability of forest seedlings produced in nurseries by two women's groups supported by the project.
- Drawing up local development plans in six villages in the landscape in Côte d'Ivoire and, on this basis, building up the local development committees' capacity and developing income-generating activities (makore butter production, good agricultural practices in cocoa farming, cane rat farming[b], heliciculture[c], fish farming, rice farming, pig farming, market gardening, subsistence farming, etc.) based on the choices of the communities in Côte d'Ivoire and Liberia.
- In parallel with actions to promote local development, and so as to capitalise on, develop and maintain the gains made in terms of community perception and commitment to nature conservation and biodiversity, the project supports environmental education awareness-raising relays – 'nature conservation clubs' – in 16 villages in Côte d'Ivoire and six in Liberia.

The results obtained regarding the preservation or restoration of residual forests (village forests and river banks) and local development based on natural resources can already be shared for use in local authority planning (regions and communes). They have been integrated into the Green Growth Plan for the Cavally region, and will be in the Taï commune's Green Plan.

A satisfaction survey was carried out in August 2023 among local and regional stakeholders, community members, authorities and decentralised services and provided a positive assessment of (i) the degree of information on the concept of ecological connectivity for conservation and the measures implemented to this end, and (ii) the proportion of people who have derived added value from the activities implemented for their benefit.

Vincent Beligné, Forests, Agroforestry and Environment Advisor to the PAPFor-TGKS project

a) The German Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, BMZ) is developing two complementary projects, in collaboration with the German Development Agency (Gesellschaft für Internationale Zusammenarbeit, GIZ) and the German National Development Bank (Kreditanstalt für Wiederaufbau, KfW).

*b) The greater cane rat (*Thryonomys swinderianus*) is a large rodent species which is farmed for its meat for human consumption. The species is found in open environments, pre-forest savannahs and very degraded open forests. It heavily colonises cultivated land and has the particularity of being highly resistant to human pressures.*

c) Heliciculture is the breeding of snails, in this case for human consumption.

*Kplé almonds (*Irvingia gabonensis*, Irvingiaceae) undergoing a drying process before being blended as part of a sauce preparation. (© C. Moumbogou)*

CONCLUSION

In conclusion, it should be stressed that no single approach mentioned here is a miracle recipe, and that the best results for the conservation of West Africa's dense rainforests will be obtained by combining them. Moreover, depending on the specific context, some approaches are more appropriate than others. The effectiveness of the responses to be implemented depends on the local context, in particular practices already implemented, stakeholders present in the area, pressures of deforestation and forest degradation encountered, and compromises faced by local stakeholders.

6

BIBLIOGRAPHY

6

BIBLIOGRAPHY

African Union (2003). African Convention on the Conservation of Nature and Natural Resources. Adopted by the 2nd Ordinary Session of the Assembly. Maputo, Mozambique. 47 p.

Aigbe, H.I., S.O. Akindele and J.C. Onyekwelu (2014). Tree species diversity and density pattern in Afi River Forest Reserve, Nigeria. *International Journal of Scientific and Technology Research, 3*(10), pp.178-185.

Allen, T., K.A. Murray, C. Zambrana-Torrelio, S.S. Morse, C. Rondinini, M. Marco, N. Breit et al. (2017). Global hotspots and correlates of emerging zoonotic diseases. *Nature Communications*, 8(1), p.1124. https://doi.org/10.1038/s41467-017-00923-8

Amara, E., J. Heiskanen, E. Aynekulu and P.K. Pellikka (2019). Relationship between carbon stocks and tree species diversity in a humid Guinean savanna landscape in northern Sierra Leone. *Southern Forests: a Journal of Forest Science, 81*(3), pp. 235-245.

Anonymous (2022). *Rapport d'analyse sur l'efficacité de gestion du futur Parc National de Pinselli, Soyah & Sabouyah avec 'Integrated Management Effectiveness Tool' IMET 2.2.* Conakry, August, pp. 22-27. 36 p.

ARD (2006). *Protected area policy working group: conflict management and dispute resolution strategy and action plan*. Publication produced for review by United State Agency for International Development.

Arinloye, A.D.D., A. Degrande, V.N. Fassinou Hotegni, E. Asaah, R. Bockarie, J.B. Nyemeck, J. Bayala and A. Kalinganire (2017). Value chain development for mango (*Mangifera indica*) around Outamba Kilimi National Park in Sierra Leone: constraints and opportunities for smallholders. *Agriculture & Food Security, 6*, pp. 1-13.

World Bank (2017). Before it's too late: deriving sustainable value from wildlife in the Western Congo Basin. © World Bank. Washington, United States. 112 p. https://documents.banquemondiale.org/en/publication/documents-reports/documentdetail/787301528984205474/before-it-s-too-late-deriving-sustainable-value-from-wildlife-in-the-western-congo-basin

Barrios, S., L. Bertinelli and E. Strobl (2006). Climatic change and rural-urban migration: The case of sub-Saharan Africa. *Journal of Urban Economics*, 60(3), pp. 357-371.

Belle, E.M.S., N.D. Burgess, M. Misrachi, A. Arnell, B. Masumbuko, J. Somda, A. Hartley, R. Jones, T. Janes, C. McSweeney, C. Mathison, C. Buontempo, S. Butchart, S.G. Willis, D.J. Baker, J. Carr, A. Hughes, W. Foden, R.J. Smith, J. Smith, S. Stolton, N. Dudley, M. Hockings, J. Mulongoy and N. Kingston (2016). *Climate Change Impacts on Biodiversity and Protected Areas in West Africa, Summary of the main outputs of the PARCC project, Protected Areas Resilient to Climate Change in West Africa*. UNEP-WCMC, Cambridge, United Kingdom.

BirdLife International (2020). Handbook of the Birds of the World and BirdLife International digital checklist of the birds of the world. Version 5. Available at: http://datazone.birdlife.org/userfiles/file/Species/Taxonomy/HBW-BirdLife_Checklist_v5_Dec20.zip

BirdLife International (2023). Important Bird Area factsheet: Afi River Forest Reserve. Downloaded from http://datazone.birdlife.org/site/factsheet/afi-river-forest-reserve-iba-nigeria on 17 October 2023.

BirdLife International (2023). Important Bird Area factsheet: Ankasa Resource Reserve – Nini-Sushien National Park. Downloaded from http://datazone.birdlife.org/site/factsheet/ankasa-resource-reserve--nini-sushien-national-park-iba-ghana on 17 October 2023.

BirdLife International (2023). Important Bird Area factsheet: Kakum National Park - Assin Attandaso Resource Reserve. Downloaded from http://datazone.birdlife.org/site/factsheet/kakum-national-park--assin-attandaso-resource-reserve-iba-ghana on 19 October 2023.

BirdLife International (2023). Important Bird Area factsheet: Mount Nimba Strict Nature Reserve. Downloaded from http://datazone.birdlife.org/site/factsheet/mount-nimba-strict-nature-reserve-iba-côte-divoire on 11 October 2023.

BirdLife International (2023). Important Bird Area factsheet: Okomu National Park. Downloaded from http://datazone.birdlife.org/site/factsheet/okomu-national-park-iba-nigeria on 24 October 2023.

BirdLife International (2023). Important Bird Area factsheet: Outamba-Kilimi National Park. Downloaded from http://datazone.birdlife.org/site/factsheet/outamba-kilimi-national-park-iba-sierra-leone on 4 October 2023.

Boesch, C., A. Gotanegre, A. Hillers, J. Kouassi, H. Boesch, P. Kizila and E. Normand (2021). Lessons learned while protecting wild chimpanzees in West Africa. *American Journal of Primatology, 83*(4), e23209.

Bruce, T., T. Wacher, H. Ndinga, V. Bidjoka, F. Meyong, M. Ngo Bata, J. Easton, O. Fankem, T. Elisee, P.A. Taguieteu and D. Olson. (2017). *Camera-trap survey for larger terrestrial wildlife in the Dja Biosphere Reserve, Cameroon*. Zoological Society of London (ZSL) & Ministry of Forests and Fauna (MINFOF), Yaoundé, Cameroon.

Casado, N. (2017). Camera trap survey in the Western Area Peninsular National Park, Sierra Leone. Tacugama Chimpanzee Sanctuary & Tusk. Freetown, Sierra Leone, 60 pp..

N'Zérékoré Forest Centre (2021). Plan d'aménagement et de gestion de la forêt classée de Diécké. Republic of Guinea, Ministry of the Environment, Water and Forests, N'Zérékoré Forest Centre, 149 pp..

CEPF (2022). Long-Term Strategic Vision for the Critical Ecosystem Partnership Fund investment in the Guinean Forests of West Africa Biodiversity Hotspot. BirdLife International, December 2022, 87 pp..

Collective (2002). Mémento de l'Agronome. Ministère des affaires étrangères, Centre de coopération internationale en recherche agronomique pour le développement (Cirad), Groupe de recherche et d'échange technologique (Gret), Paris, France.

Curtis, P.G., C.M. Slay, N.L. Harris, A. Tyukavina and M.C. Hansen (2018). Classifying drivers of global forest loss. *Science, 361*(6407), pp. 1108-1111.

Niamey Declaration of 11 June 2021. Towards responsible mining and sustainable development.

De Roover, 2022. Analyse de la chaine de valeur hévéa selon la méthode VCA4D, dans les territoires de Lodja et Lomela, Province du Sankuru, RDC, en vue de la relance de la filière. Mémoire de fin d'études. Gembloux Agro-Bio Tech, University of Liege, Belgium. 59 pp. + appendices.

de Wasseige, C., M. Marshall, G. Mahé and A. Laraque (2015). 'Interactions between climate characteristics and forests', In: The Forests of the Congo Basin – Forests and climate change. Eds: de Wasseige, C., M. Tadoum, R. Eba'a Atyi, and C. Doumenge. Weyrich, Belgium, pp. 53-64. https://www.observatoire-comifac.net/publications/edf/2015?lang=en

Dudley, N. (Ed.) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86 pp. with Stolton, S., P. Shadie and N. Dudley (2013). IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No 21, Gland, Switzerland. IUCN. 143pp.

EFI & Nitidae (2021). Sustainability initiatives in Ivorian and Ghanaian cocoa supply chains: benchmarking and analysis. 57 pp. https://www.nitidae.org/files/766babc9/sustainability_initiatives_in_ivorian_and_ghanaian_cocoa_supply_chains_benchmarking_and_analysis.pdf

EITI (2022). Extractive Industries Transparency Initiative – EITI Côte d'Ivoire. EITI 2020 Report. Extractive Industries Transparency Initiative, Côte d'Ivoire.

European Commission, Directorate-General for International Cooperation and Development, Murray, M., C. Paolini, R Olivier et al. (2016). Larger than elephants – Inputs for an EU strategic approach to wildlife conservation in Africa – Regional analysis, Publications Office. https://data.europa.eu/doi/10.2841/123569

BIBLIOGRAPHY

European Commission, Directorate-General for International Cooperation and Development, MacKinnon, J., C. Aveling, R. Olivier et al. (2015). Larger than elephants – Inputs for an EU strategic approach to wildlife conservation in Africa – Synthesis, Publications Office of the European Union. https://data.europa.eu/doi/10.2841/909032

European Commission, Joint Research Centre (2023). The Digital Observatory for Protected Areas (DOPA) [Online], 12/2023, Ispra, Italy. https://dopa.jrc.ec.europa.eu/dopa/

Falcon, W.P., R.L. Naylor and N.D. Shankar (2022). Rethinking global food demand for 2050. *Population and Development Review, 48*(4), pp. 921-957.

FAO (2008). Forests and energy, FAO Forestry Paper 154, Food and Agriculture Organisation of the United Nations, Rome,, 82 pp. https://www.fao.org/fileadmin/user_upload/rome2007/docs/Forests%20and%20energy.pdf

FAO (2020). Global Forest Resources Assessment 2020: Main report. Rome. https://doi.org/10.4060/ca9825en

FAO (2022) The State of the World's Forests 2022. Forest pathways for green recovery and building inclusive, resilient and sustainable economies, Rome, FAO., https://doi.org/10.4060/cb9360en

Fauna & Flora International (2021). Coordinated and collaborative application of the mitigation hierarchy in complex multi-use landscapes in Africa: Upper Guinean Forest transboundary landscape. Opportunities and challenges for maintaining a connected forest landscape in the face of development pressures. FFI, Cambridge U.K.,91 pp. Available from: www.fauna-flora.org

Fauna & Flora International (2020). Conserving and connecting the Ziama-Wonegizi-Wologizi (ZWW) Transboundary Forest landscape between Guinea and Liberia. Final Report (April 2018-June 2020) for USAID/WA BiCC.

International Monetary Fund. African Dept. (2013). West African Economic and Monetary Union (WAEMU): Staff Report on Common Policies for Member Countries, IMF Country Reports, 13/092, IMF, Washington, United States, 106 pp. https://www.elibrary.imf.org/view/journals/002/2013/092/002.2013.issue-092-en.xml

Forestry Development Authority (2014). East Nimba Nature Reserve Management Plan. ENNR – THIRD Draft Management Plan. Forestry Development Authority, Republic of Liberia, 101 pp.

Forestry Development Authority (2023) Gazettement Package Kwa National Park. Forestry Development Authority, Whein Town, Mount Barclay, Montserrado County, Liberia. 44 pp.

GHEITI (2022). GHEITI Report on mining sector. Ghana Extractive Industries Transparency Initiative, Ghana.

Global Footprint Network (2010). National Footprint Accounts 2010. http://www.footprintnetwork.org/en/index.php/GFN/page/footprint_for_nations/

Goldman, E., M. Weisse, N. Harris and M. Schneider (2020). Estimating the role of seven commodities in agriculture-linked deforestation: Oil palm, soy, cattle, wood fiber, cocoa, coffee, and rubber. *Technical Note, World Resources Institute*.

Government of Sierra Leone (2010). Strategy for the Development of a Climate Change Abatement Economy: Introducing and Implementing REDD/REDD+ in Sierra Leone. Concept Note. 22 pp.

Government of Sierra Leone (2021). National Adaptation Plan. 84 pp.

Government of Sierra Leone (2021). Updated Nationally Determined Contribution (NDC). 68 pp.

GRASP. National Action Plan for the conservation of chimpanzees in Guinea, Ministry of Agriculture, Livestock, Water, and Forests, National Directorate of Water and Forests, Great Apes Survival Project (GRASP). 43 pp.

Haurez, B., D. Fonteyn, S. Toint, C. Bracke,J.-L., Doucet, K. Daïnou, S. Kéhou and C. Vermeulen (2020). Élaboration et mise en œuvre d'un plan de gestion de la faune. Guide technique à destination des gestionnaires des forêts de production d'Afrique centrale. Gembloux, Belgium: Presses Agronomiques de Gembloux. Available at: https://orbi.uliege.be/handle/2268/253115

Hilty, J.*, G.L. Worboys, A.* Keeley, S.* Woodley, B. Lausche, H. Locke, M. Carr, I. Pulsford J. Pittock, J.W. White, D.M. Theobald, J. Levine, M. Reuling, J.E.M. Watson, R. Ament and G.M.* Tabor (2020). Guidelines for conserving connectivity through ecological networks and corridors. C. Groves (Ed.). International Union for Conservation of Nature. https://portals.iucn.org/library/node/49061

Hockings, M., S. Stolton, F. Leverington, N. Dudley and J. Courrau (2006). Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas. 2nd edition. IUCN, Gland, Switzerland and Cambridge, United Kingdom, xiv + 105 pp.

Hosonuma, N., M. Herold, V. De Sy, R.S. De Fries, M. Brockhaus, L. Verchot, A. Angelsen and E. Romijn (2012). An assessment of deforestation and forest degradation drivers in developing countries. *Environmental Research Letters*, 7(4), 044009.

International Religious Freedom Report (2014). https://reliefweb.int/report/world/2014-international-religious-freedom-report

IUCN, Regional Office for Western Africa (2008). Evaluation de l'efficacité de la gestion des aires protégées : aires protégées de la République de Guinée, Evaluation de l'Efficacité de la Gestion des Aires Protégées no.5, IUCN, Ouagadougou, BF, 2008

IUCN (2015). Ecosystem profile Guinean Forests of West Africa Biodiversity Hotspot. Critical Ecosystem Partnership, 403 pp.

IUCN/PACO (2012). Mining sector development in West Africa and its impact on conservation. Gland, Switzerland and Ouagadougou, Burkina Faso, IUCN/PACO.

IUCN and UNEP-WCMC (2020). The World Database on Protected Areas (WDPA), UNEP-WCMC Cambridge, United Kingdom. Available at: www.protectedplanet.net; see https://www.protectedplanet.net/en/search-areas?filters%5Bdb_type%5D%5B%5D=wdpa&geo_type=region

Jalloh, A., G.C. Nelson, T.S. Thomas, R.B. Zougmoré and H. Roy-Macauley (Eds.) (2013). West African agriculture and climate change: a comprehensive analysis. International Food Policy Research Institute, Washington, DC, United States of America, 444 pp.

Jacquemard, J.C. (1995). Le palmier à huile. Maisonneuve et Larose.

Key Biodiversity Areas Partnership (2023). Key Biodiversity Areas factsheet: Ankasa Resource Reserve - Nini-Sushien National Park. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Downloaded from http://www.keybiodiversityareas.org/ on 17 October 2023.

Key Biodiversity Areas Partnership (2023). Key Biodiversity Areas factsheet: Krahn Bassa South. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Downloaded from http://www.keybiodiversityareas.org/ on 19 October 2023.

Kingdon, J. (2015). The Kingdon field guide to African mammals. 2nd edition. Bloomsbury Publishing.

Kollert & Kleine (Eds.) (2017). The Global Teak Study. Analysis, Evaluation and Future Potential of Teak Resources. IUFRO World Series, Volume 36, Vienna, 108 pp.

Larzilière, A., C. Vermeulen, E. Dubiez, T. Yamba Yamba, S. Diowo and G. Mumbere (2013). Interactive Scale Models, A Novel Way of Prompting Constructive Participation, *Bois et Forêts des Tropiques, 315*(1), Société pour le Développement de l'Utilisation des Bois Tropicaux, Paris, France. https://orbi.uliege.be/handle/2268/149343

LEITI (ND). Liberia Extractive Industries Transparency Initiative 2020-2021. Liberia Extractive Industries Transparency Initiative, Liberia.

Lewis, M.P., G.F. Simons and C.D. and Fennig (Eds.) (2015). Ethnologue: Languages of the World. 18th Edition, SIL International, Dallas, Texas, United States of America.

Lhoest, S. and C. Vermeulen (2021). Analysis of research strategies and their integration into conservation: The case of the ECOFAC network protected areas in Central Africa, ECOFAC 6, Expert Report, 75 pp.

Loh, J. and D. Harmon (2005). A global index of biocultural diversity. *Ecological indicators*, 5(3), pp. 231-241.

Luiselli, L., D. Dendi, E.A. Eniang, B.B. Fakae, G.C. Akani and J.E. Fa (2019). State of knowledge of research in the Guinean forests of West Africa region. *Acta Oecologica, 94*, pp. 3-11.

Luiselli, L. and J.E. Fa (2018). Ecology and conservation of West African forests: An introduction. *Acta Oecologica, 94*, ISSN 1146-609X.

LTS International & ONF International (2011). Toward a West African Forests Strategy. Working draft. 107 pp. https://www.profor.info/sites/profor.info/files/WAFS-draft-42111_0.pdf

McCollum, K.R., E. Belinfonte, A.L. Conway and J.P. Carroll (2018). Occupancy and habitat use by six species of forest ungulates on Tiwai Island, Sierra Leone. Koedoe: *African Protected Area Conservation and Science, 60*(1), pp. 1-5.

BIBLIOGRAPHY

MEEF – PNCCG (2020). National Action Plan for the Conservation of Chimpanzees in Guinea, 2020-2030, Ministry of the Environment, Water, and Forests, Conakry, Republic of Guinea,, p.112,. www.guineachimpanzees.com/action-plan

Meijaard, E., J. Garcia-Ulloa, D. Sheil, K.M. Carlson, S.A. Wich, D. Juffe-Bignoli and T.M. and Brooks (2018). Oil palm and biodiversity: a situation analysis by the IUCN Oil Palm Task Force, IUCN, Gland, Switzerland, 116 pp. https://portals.iucn.org/library/node/47753

Meunier, Q., C. Moumbogou and J.L. Doucet (2015). Les arbres utiles du Gabon. Presses agronomiques de Gembloux.

Ministry of Agriculture, Livestock, Environment, Water, and Forests (2007). Stratégie nationale de gestion des éléphants en République de Guinée 2007-2016, National Directorate of Water and Forests, US Fish and Wildlife Service, 44 pp. https://faolex.fao.org/docs/pdf/Gui191461.pdf

Ministry of Water and Forests (2019). Stratégie de préservation, de réhabilitation et d'extension des forêts, Ministry of Water and Forests, Abidjan, Côte d'Ivoire, 52 pp. https://faolex.fao.org/docs/pdf/ivc213819.pdf

Minority Rights Group International (2014). People under threat. State of the World's Minorities and Indigenous Peoples 2014. Minority Rights Group International. London, United Kingdom.

Mittermeier, R.A., P.R. Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C.G. Mittermeier and G.A.B. Da Fonseca (2004). Hotspots revisited: Earth's biologically richest and most threatened ecoregions. CEMEX, Mexico City, Mexico.

Mittermeier, R.A., A.B. Rylands, D.E. Wilson (Eds.) (2013). Handbook of the Mammals of the World. Vol. 3. Primates. Lynx Editions, Conservation International, IUCN.

Mononen, K. and S. Pitkänen (2016). Sustainable fuelwood management in West Africa. University of Eastern Finland: Joensuu/Kuopio, Finland, 150 pp.

Morgan, B.J. et al. (2011). Regional Action Plan for the Conservation of the Nigeria-Cameroon Chimpanzee (*Pan troglodytes ellioti*). IUCN/SSC Primate Specialist Group and Zoological Society of San Diego, CA, United States of America,, 52 pp.

Mulongoy, J. (2015). Regional strategy and policy recommendations for the planning and management of protected areas in the face of climate change, UNEP-WCMC technical report, PARCC West Africa, 2015, 50 p. http://parcc.protectedplanet.net/system/comfy/cms/files/files/000/000/054/original/PARCC_framework_and_METT_tool_FINAL_ENG.pdf

NEITI, 2022. Solid minerals industry report 2020. Nigeria Extractive Industries Transparency Initiative, Nigeria.

Nzigiyimpa, L. (2022). Management Effectiveness of East Nimba Nature Reserve. IMET Baseline Assessment 2022 Report. UNOBS, Support Programme for the Preservation of Forest Ecosystems in Mount Nimba, (PAPFor), 18 pp.

OCB (2022). Towards biodiversity certificates: proposal for a methodological framework. Carbone 4 and the Muséum national d'Histoire naturelle, 54 pp.

OECD (2006). Les langues, Atlas de l'Intégration Régionale en Afrique de l'Ouest. Série Population, CEDEAO CSAO/OCDE, 12 pp.

OECD (2012). Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships. OECD Better Policies for Better Lives, 28 pp. https://www.oecd.org/governance/budgeting/PPP-Recommendation.pdf

OECD & Sahel and West Africa Club (2009). Regional Atlas on West Africa, Éditions OCDE, Paris. https://www.oecd-ilibrary.org/fr/development/regional-atlas-on-west-africa_9789264056763-en

OECD & Sahel and West Africa Club (2014). An Atlas of the Sahara-Sahel Geography, Economics and Security, OECD. https://www.oecd-ilibrary.org/fr/agriculture-and-food/an-atlas-of-the-sahara-sahel_9789264222359-en

OECD (2016). Biodiversity Offsets: Effective Design and Implementation, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264222519-en

OECD/SWAC (2020). Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography, West African Studies, OECD Publishing, Paris. https://doi.org/10.1787/b6bccb81-en; https://read.oecd-ilibrary.org/development/africa-s-urbanisation-dynamics-2020_b6bccb81-en#page55

OECD (2022). Cross-border transhumance challenged by security measures, Maps & Facts 111. www.oecd.org/swac/maps

Ogana, T.E. and F.N. Ogana (2017). Quantification of the effect of agriculture on forest carbon stock: Case study of a Nigerian forest reserve. *The Journal of the Society for Tropical Plant Research, 6*(1), pp. 106-114. DOI: 10.22271/tpr.2019.v6.i1.015

Ortiz-Bobea, A., T.R. Ault, C.M. Carrillo, R.G. Chambers and D.B. Lobell (2021). Anthropogenic climate change has slowed global agricultural productivity growth. *Nature Climate Change*, 11(4), pp. 306-312.

Owusu, G., A.K. Anning, E.J. Belford and E. Acquah (2022). Plant species diversity, abundance and conservation status of the Ankasa Resource Reserve, Ghana. *Trees, Forests and People, 8*, 100264.

Pacheco, P., K. Mo, N. Dudley, A. Shapiro, N. Aguilar-Amuchastegui, P.Y. Ling, C. Anderson and A. Marx (2021). Deforestation fronts: Drivers and responses in a changing world. WWF, Gland, Switzerland, 125 pp.

Paolini, C. and D. Rakotobe (2022) Coaching manual for the Integrated Management Effectiveness Tool, IUCN, Gland, Switzerland. https://portals.iucn.org/library/node/51272

Ricks, B.Z. (2019). Assessing the administrative and governance challenges in the implementation of CITES law enforcement in Sapo National Park in Liberia. (Master's thesis, Universidad Internacional de Andalucía), 69 pp. + appendices.

Rödel, M.O. and J. Glos (2019). Herpetological surveys in two proposed protected areas in Liberia, West Africa. *Zoosystematics and Evolution, 95*(1), pp. 15-35.

RPCA (ND). Food issues: demographic, urban, migration and security challenges, Maps & Facts 2, 40 pp.

RSPO (2020). Principles and criteria for the production of Sustainable Palm Oil 2018. https://rspo.org/wp-content/uploads/rspo-principles-criteria-for-production-of-sustainable-palm-oil-2018revised-01-february-2020-with-updated-supply-chain-requirements-for-mills.pdf

Sáfián, S., S. Koïvogui, G. Simonics and K.J. Florczyk (2020). Butterfly diversity (Lepidoptera: Papilionoidea) in the Ziama Massif in Guinea and the adjacent Wonegizi and Wologizi Mountains in Liberia (West Africa): A transboundary conservation approach. *Metamorphosis 31*(1), pp. 104-128.

Sako, N. and G. Beltrando (2014). Dynamiques spatiales récentes du Parc National du Banco (PNB) et stratégies de gestion communautaire durable de ses ressources forestières (District d'Abidjan en Côte d'Ivoire). EchoGéo, (30). https://journals.openedition.org/echogeo/13906?lang=en

SLEITI (2023). EITI report, 2020-2021. Sierra Leone Extractive Industries Transparency Initiative, Sierra Leone.

Sumaila, M., J. Agyei-Ohemeng, O. Richard, A.F. Boafo and A. William (2020). Diversity, abundance and distribution of birds in and around Kakum National Park in respect to habitat type. *Ecology and Sustainable Development, 3*(2), pp. 23-43.

Tetra Tech. (2020). USAID/West Africa Biodiversity and Climate Change (WA BiCC), Year Five Annual Report (October 2019-September 2020), 122 pp.

Trégourès, A., F. Bianen, C. Vermeulen, E. Koussafoula, M. Makani, M. Jampy and C Julve (2023). Pistes pour la mise en oeuvre d'un mécanisme de partage de bénéfices en périphérie d'une aire protégée. L'exemple du Fonds de Développement Local au Parc National d'Odzala-Kokoua, CongoBrazzaville. Field brief. ORBi-University of Liege. https://orbi.uliege.be/handle/2268/303580

Tychsen, J. & N. Charles (Eds.) (2019). La mine artisanale en Afrique de l'Ouest francophone. Service géologique du Danemark et du Groenland (GEUS) – Copenhague/Danemark et Service géologique de la France (BRGM) – Orléans/France, 300 pp.

UNDP (2006). CIVICUS Civil Society Index for the Republic of Sierra Leone – A Critical time for Civil Society in Sierra Leone. http://www.civicus.org/media/CSI_SierraLeone_Country_Report.pdf

UNDP (2006). Evaluation of UNDP Assistance to Conflict-Affected Countries. United Nation Development Programme, Evaluation Office, New York, United States of America, 133 pp. http://web.undp.org/evaluation/evaluations/documents/thematic/conflict/ConflictEvaluation2006.pdf

UNEP (2008). Africa: Atlas of Our Changing Environment. Division of Early Warning and Assessment (DEWA), United Nations Environment Programme (UNEP), Nairobi, Kenya.,393 pp. https://www.unep.org/resources/report/africa-atlas-our-changing-environment

UNEP-WCMC (2013). CITIES at 40: perspectives, trade patterns and future prospects. UNEP- WCMC, Cambridge, United Kingdom. https://euanalysis2013.unep-wcmc.org/files/2015/11/Analysis-of-EU-Annual-Reports-2013_Public1.pdf

Vancutsem, C., F. Achard, J.-F. Pekel, G. Vieilledent, S. Carboni, D. Simonetti, J. Gallego, L.E.O.C. Aragão and R. Nasi, (2021). Long-term (1990-2019) monitoring of forest cover changes in the humid tropics. *Science Advances 7*,eabe1603. DOI:10.1126/sciadv.abe1603

BIBLIOGRAPHY

van Schaik, L. and R. Dinnissen (2014). Terra incognita: land degradation as underestimated threat amplifier. Clingendael Report. Netherlands Institute of International Relations, 72 pp.

Vermeulen, C., A. Trégourès, E. Koussafoula and C. Julve (2023). Le compagnonnage comme stratégie de lutte contre la pauvreté et le braconnage en périphérie des aires protégées. L'exemple du Parc National d'Odzala Kokoua, Congo Brazzaville. Field brief, Ecofac VI (UE), Parc National d'Odzala-Kokoua (République du Congo), Nature + African Parks (AP), Fondation Odzala-Kokoua-Lossi (FOKL). https://orbi.uliege.be/handle/2268/301835

Warner, K., C. Erhart, A. de Sherbinin, S. Adamo and T. Chai-Onn (2009). In Search of Shelter: Mapping the effects of climate change on human migration and displacement. Care International, Atlanta, Georgia, United States of America.

Wild Chimpanzee Foundation (2023). CEPF Final Completion and Impact Report. 23 pp. https://www.cepf.net/sites/default/files/final-report-104076.pdf

Wild Chimpanzee Foundation (ND). Key facts: Krahn-Bassa Proposed Protected Area (KBPPA). 5 pp. https://www.cepf.net/sites/default/files/key-facts-kbppa.pdf

Wildlife Division (Forestry Commission) Ghana (2000). Ankasa Conservation Area Management Plan. Protected Areas Development Programme, Wildlife Division (Forestry Commission) Ghana, 138 pp.

Williams, J.N. (2011). Human Population and the Hotspots Revisited: A 2010 Assessment. In: Zachos, F. and J. Habel (Eds.) Biodiversity Hotspots. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-20992-5_4

Wilson, D.E. and R.A. Mittermeier (Eds.) (2009). Handbook of the Mammals of the World, Vol. 1. Carnivores. Lynx Editions, Conservation International, IUCN.

Woodwell J.C. (2002). Fuelwood and Land Use in West Africa: Understanding the Past to Prepare for the Future. Joint workshop in Ouagadougou, Burkina Faso, 16-19 July 2002. Comité Inter-Etats de Lutte contre la Sécheresse au Sahel and United States Agency for International Development, 40 pp.

World Bank (2010). Sierra Leone – Biodiversity Conservation Project (English). Washington, DC, World Bank Group. http://documents.worldbank.org/curated/en/425381468300853535/Sierra-Leone-Biodiversity-Conservation-Project

World Bank (2013). The World Bank – World Development Indicators. International Bank for Reconstruction and Development, The World Bank. Washington DC, United States of America, 145 pp. https://databankfiles.worldbank.org/public/ddpext_download/WDI-2013-ebook.pdf

World Bank Group & ProFor (2016). Biodiversity Offsets: a user guide, 70 pp.

Internet sites:

https://agricultural-production-hotspots.ec.europa.eu/

https://archive.pfbc-cbfp.org/docs/news/Septembre%202019/co%20management%20of%20parks%20in%20Central%20Africa.pdf

https://archive.pfbc-cbfp.org/docs/news/Septembre%202019/COMIFAC%20Guide%20PPP.pdf

https://atlasocio.com/classements/economie/agriculture/classement-etats-par-production-caoutchouc-naturel-monde.php

https://dopa-explorer.jrc.ec.europa.eu/

https://forobs.jrc.ec.europa.eu/TMF/data#downloads

https://nigeria.wcs.org/wild-places/cross-river-np-oban.aspx

https://nigeria.wcs.org/Wild-Places/Cross-River-NP-Okwangwo.aspx

https://sustainablenaturalrubber.org/

https://rris.biopama.org/biopama_stories/sustainable-landscapes-post-crisis-times

https://uses.plantnet-project.org/

https://whc.unesco.org/en/tentativelists/6204/

https://whc.unesco.org/en/tentativelists/6589/

https://whc.unesco.org/fr/list/155/

https://whc.unesco.org/fr/listesindicatives/5741/

https://whc.unesco.org/fr/listesindicatives/6650/

https://whc.unesco.org/fr/soc/4268

https://www.cirad.fr/les-actualites-du-cirad/actualites/2019/science/caoutchouc-selection-genomique-de-l-hevea

https://www.cirad.fr/nos-activites-notre-impact/filieres-agricoles-tropicales/hevea/contexte-et-enjeux

https://www.cms.int/fr/legalinstrument/el%C3%A9phants-dafrique-de-louest

Crops and livestock products – Natural rubber in primary forms: https://www.fao.org/faostat/en

https://www.globalforestwatch.org/

https://www.greencorridor.info/index.html

https://www.indexmundi.com/agriculture/?commodity=palm-oil&graph=production

https://www.insu.cnrs.fr/fr/cnrsinfo/les-terres-rares-le-paradoxe-environnemental

https://www.iucnredlist.org/

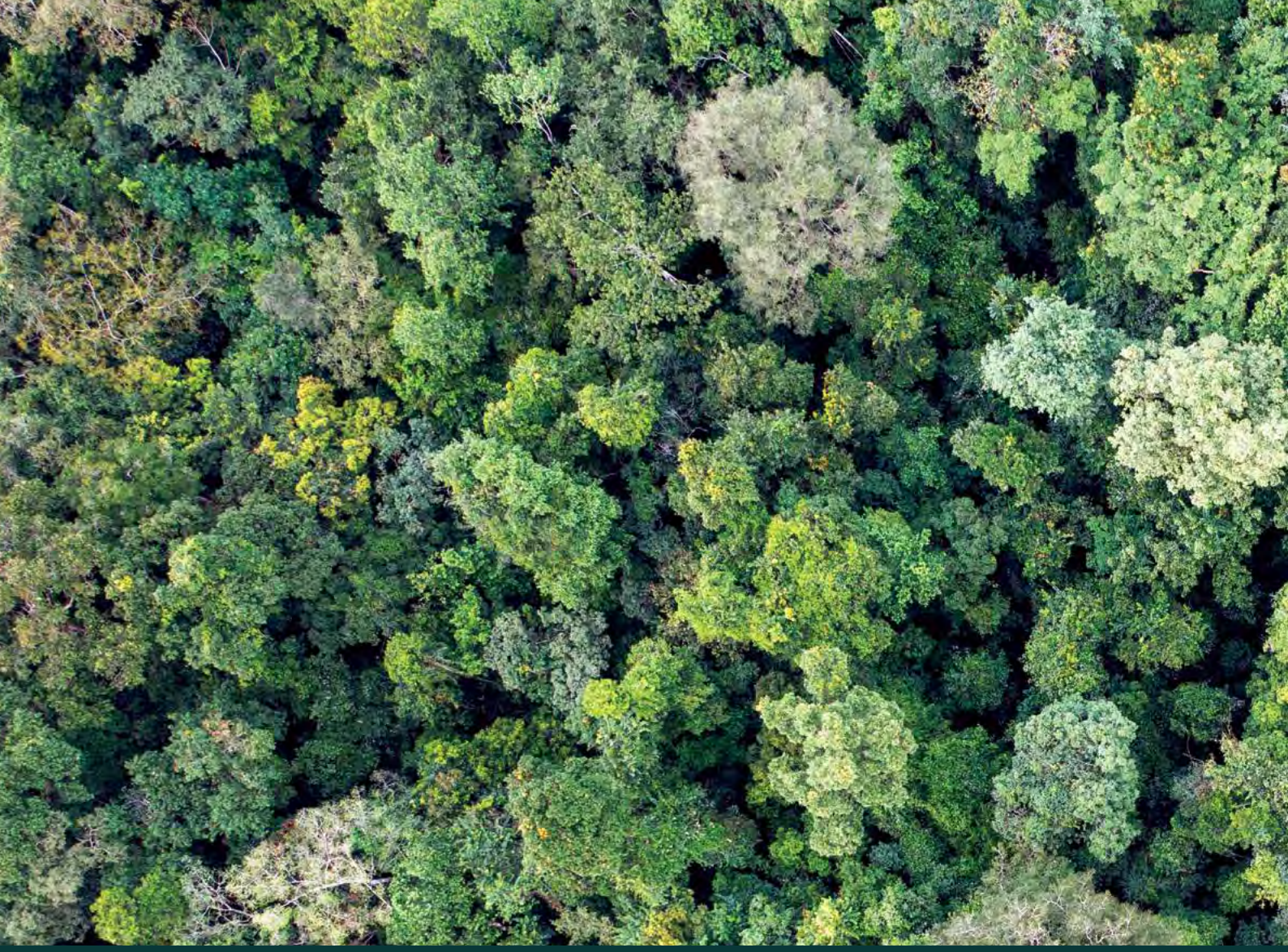
https://www.mightyearth.org/chocolate/

https://www.observatoire-comifac.net/monitoring_system/imet

https://www.oneearth.org/realms/afrotropics

https://www.swm-programme.info/en/homepage

https://www.worldwildlife.org/ecoregions



PUBLISHED AS PART OF THE SUPPORT PROGRAMME FOR THE PRESERVATION
OF FOREST ECOSYSTEMS IN WEST AFRICA (PAPFor).

ISBN: 978-2-931311-01-1