



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

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SYNOPSIS

The case study reports on the findings of an in-depth desk-based study to support the preliminary testing phase of a conceptual framework designed to embed nature and socioecological considerations into land use and development processes in multi-use landscapes and to encourage coordinated and collaborative application of the mitigation hierarchy at industry operation (project) and landscape scales (see [report FFI, 2021a](#)).

This case study focuses on the **biodiversity-rich but fragmented forests of the Guinea Forestière region of south-eastern Guinea, in the context of a dynamic transboundary landscape** that extends into north eastern **Sierra Leone** and north western **Liberia**. The landscape is important for the conservation of Western Guinean lowland forests – one of the most threatened ecoregions in Africa – supports high levels of endemism, important populations of globally threatened species, and essential ecosystem services.

The landscape includes **12 Key Biodiversity Areas** and the Nimba Mountain Range World Heritage Site (WHS). However, there are only four protected areas in the landscape with protection status equivalent to IUCN Category I or II. A further 29 forests are recognised in national legislation though this does not necessarily confer protection for biodiversity.

The landscape's forests and the biodiversity and ecosystem functions and services they maintain are under severe threat from deforestation and ecosystem degradation as a result of changing land use patterns by both local users and commercial interests. Across the landscape multiple sectors (agriculture, forestry, mining, infrastructure, and energy) are already operating and multi-sectoral development is actively promoted by the national authorities and planned on a large scale across the region, with significant private investment and technical assistance.

The landscape is expected to **face intensifying pressure because of planned development projects in the next five years**, including several large-scale iron ore mining projects in Guinea and Liberia and associated construction and improvements of transport infrastructure (roads, railways). Planned projects intersect with extremely sensitive areas that are associated with high biodiversity, ecosystem service and cultural values. These developments, particularly in Guinea Forestière, are designed to catalyse economic growth in other sectors and improve access to the region.

Planned development of regulated industry activities takes place in the context of other ongoing and intensifying threats and pressures. **Unregulated activity including land conversion for small-scale agriculture is a major contributor to deforestation** and forest degradation in the landscape, fuelled by a rapidly growing population and growth in the agricultural sector in all three countries (Guinea, Liberia and Sierra Leone). Road development and enhancement programmes are also underway or planned.

In combination, the **potential for significant adverse direct, induced and cumulative impacts on biodiversity and socioecological systems is high**: driving ongoing habitat clearance, biodiversity loss and land degradation, threatening remnant forest habitat and connectivity and compromising the long-term sustainability and resilience of the landscape for biodiversity and society.

This case study highlights:

- The importance of taking a **multi-scale, multi-stakeholder approach** to identify and address impacts from regulated and unregulated development activities
- **Roles of different landscape actors** in advancing a landscape approach to impact mitigation
- **Opportunities for strategic planning and cross-sectoral collaborations** to improve outcomes for biodiversity and ecosystem services, even in a landscape in which development decisions have already been taken
- The **role of unregulated development** (in this case small-scale agriculture) in driving landscape change and influences and constraints on smallholders to mitigate and manage their impacts.

The case study does not attempt to provide a systematic or in-depth application of FFI's conceptual framework, which would require cross-sectoral, multi-stakeholder processes, further research, analysis, and ground-truthing (to be carried out under future proposed work). However, it does draw together available information and provide a basis and recommendations from which to take framework application forward.

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1 INTRODUCTION

This case study focuses on the biodiversity-rich but fragmented forests of the Guinea Forestière region of south-eastern Guinea, in the context of a complex transboundary landscape that centres on the Guinea, Liberia and Sierra Leone borders. The Upper Guinean Forest Transboundary Landscape encompasses transboundary forests such as the Mount Nimba Strict Nature Reserve and UNESCO World Heritage Site and the Ziama-Wonegizi-Wologizi-Foya forests, and onwards to Gola. The landscape is important for the conservation of Western Guinean lowland forests, rare, unique and threatened species, and are important for maintaining the continued supply and flow of essential ecosystem services.

The case study reports on the findings of the desk-based testing phase of a conceptual framework developed for use in complex multi-use landscapes by Fauna & Flora International (FFI). The framework (shown in Figure 1) aims to embed nature and socioecological considerations into land use and development processes and to encourage coordinated and collaborative application of the mitigation hierarchy at industry operation (project) and landscape scales (see [report](#) produced by FFI, 2021a).

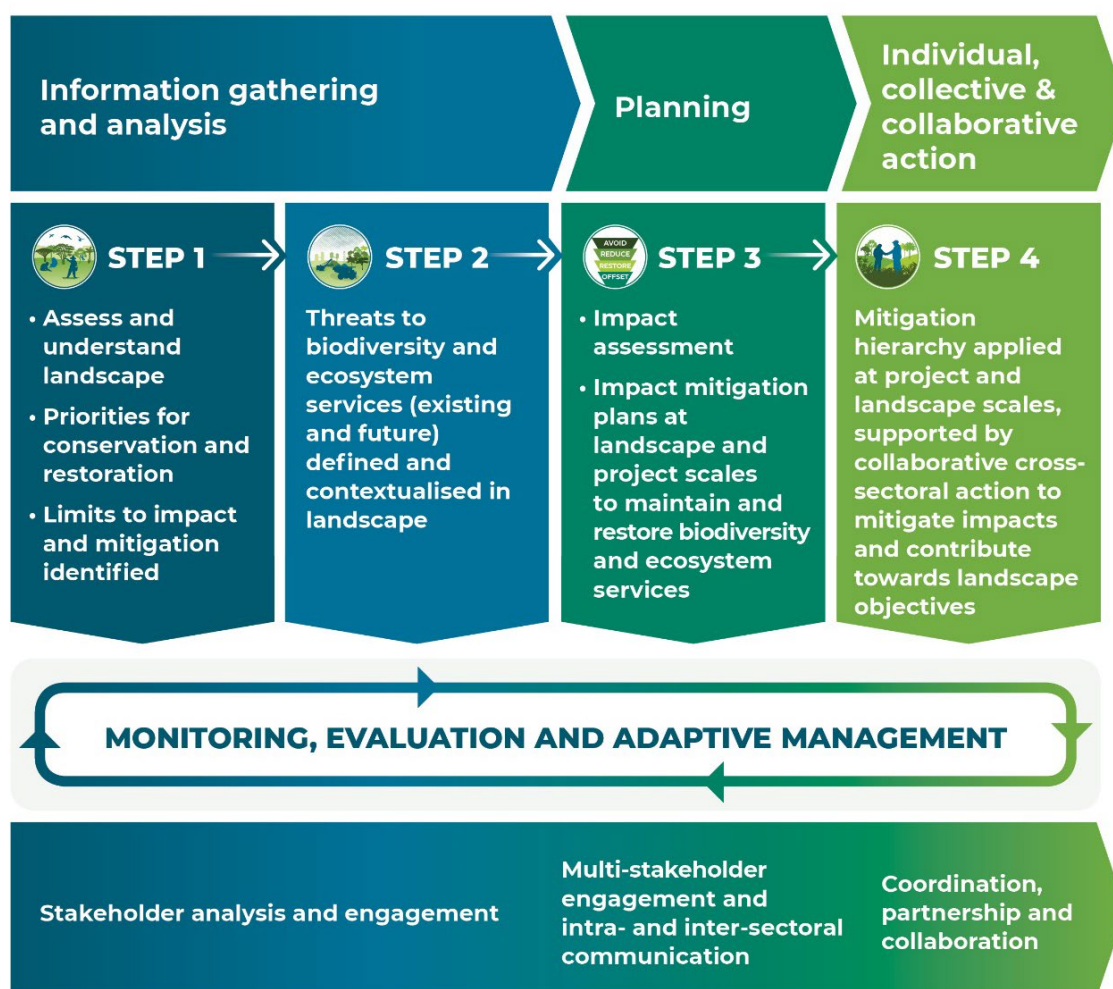


Figure 1 Main steps of conceptual framework

Across the Transboundary Landscape multiple sectors (agriculture, forestry, mining, infrastructure and energy) are already operating and multi-sectoral development (mining, construction of dams, power lines and roads, agribusiness, forestry, etc.) is actively promoted by the national authorities and planned on a large scale across the region, with significant private investment and technical assistance. The Transboundary Landscape is expected to face intensifying pressure as a result of planned development projects, including several large-scale iron ore mining projects in Guinea and Liberia and associated construction and improvements of transport infrastructure (roads, railways, ports). These developments, particularly in Guinea Forestière, are designed to catalyse economic growth in other sectors and improve access to the region. Together with rapid human population growth, a growing agricultural sector, and road development and enhancement programmes, the potential for significant cumulative impacts on biodiversity and communities is high.

Drawing on available information augmented by inputs from regional and technical experts and landscape stakeholders, this case study builds a picture of the transboundary landscape, some of the species and ecosystem uses and values, and their distribution across the landscape. It highlights the work of others in identifying indicative conservation priorities, identifies a number of data and information gaps, and provides a current perspective on existing and emerging threats and pressures. This is followed by a high-level overview of possible direct, indirect and cumulative impacts of multi-sectoral development and implications if impacts go unmitigated.

The case study then focuses in on the Guinea Forestière region of the landscape, acknowledging the anticipated intensification of threats and pressures from industry and non-industry activities and the fact that initiatives to secure the protection and sustainable management of large forest areas and their biodiversity and carbon values are already underway in other parts of the Transboundary Landscape (e.g. in Liberia through the gazettelement of Proposed Protected Areas with sustainable financing and community co-benefits through Reducing Emissions from Deforestation and Forest Degradation (REDD+)). With a focus on Guinea Forestière the case study considers several practical aspects of Framework application including: who needs to be involved, advances in the enabling environment for Framework uptake and application, and opportunities and challenges for cross-sectoral application of the mitigation hierarchy across the landscape.

The case study does not attempt to provide a systematic or in-depth application of the Framework, which would require cross-sectoral, multi-stakeholder processes, further research, analysis, and ground-truthing. However, it does draw together available information and provide a basis and recommendations from which to take Framework application forward in the landscape.

2 THE TRANSBOUNDARY LANDSCAPE

Guinea Forestière is a forested mountainous region situated in south-eastern Guinea in West Africa that extends into north eastern Sierra Leone, north western Liberia and western Côte d'Ivoire. For the purpose of this study, the Upper Guinean Forest Transboundary Landscape area (hereafter referred to as the Transboundary Landscape) centres on the Guinea, Liberia and Sierra Leone borders (Figure 2). The landscape intersects with the prefectures of Macenta, N'Zérékoré, Yomou, Guéckédou and Kissidougou in the Guinea Forestière region of Guinea, the Eastern and Northern Provinces in Sierra Leone, and Liberia's Lofa, Nimba, Gbarpolu and Bong counties to varying extents.



Figure 2 Map of transboundary landscape and location in West Africa

The following considerations informed the delineation of this study area boundary:

- Study area boundary aligned with intersecting protected and conservation areas.
- Northern and western boundaries aligned with drainage basin extents.
- Northern and western boundaries include the low-density populated provinces and town centres (University of Southampton, 2020).
- Northern boundary aligned with the transitional evergreen to semi-deciduous forest ecosystem.
- North-western boundary aligned with the Western Guinean lowland forest ecoregion (WWF, 2004).
- Western boundary informed by the commodity and shifting agriculture deforestation hot spot area (Harris et al., 2017).
- Southern boundary includes the intact forest landscape of the Kpo Mountain range (Potapov et al., 2017).
- Incorporates the known forest elephant migratory corridor between the Wonegizi-Wologizi Proposed Protected Areas, Ziama Biosphere Reserve and Mt Bero Classified Forest (Toupou, 2009) and known chimpanzee populations in Sierra Leone, Guinea and Liberia (Heinicke et al., 2019a, 2019b).

2.1 Understanding the landscape from a socioecological perspective



STEP 1

Assessing and understanding the landscape, identifying conservation and restoration priorities, and setting limits

▶ STEP 1 | STEP 2 | STEP 3 | STEP 4

Step 1 builds an understanding of the landscape including the governance and socioeconomic context, biodiversity and ecosystem service uses and values, the current state of biodiversity across the landscape, priority areas for conservation and restoration and limits to impacts. For the purpose of this desk-based case study, the following sections provide a short overview of the landscape as it relates to the main themes of Step 1 of the framework, drawing on available information, recent studies and data (spatial and non-spatial) and input from regional experts.

Landscape governance and socio-economic context

The Transboundary Landscape intersects with both Anglophone and Francophone countries each with distinct political structures, laws, and cultural histories. A variety of ecological and social factors have interacted in modern history, defining the unique socio-economic context of this landscape. It was beyond the scope of this case study to undertake detailed analysis of the governance and socio-economic context for each country and jurisdiction in the Transboundary Landscape. This section therefore focuses on the complex histories and transboundary dynamics that have shaped and continue to influence governance and socio-economic contexts of the landscape as a whole, and the co-existence of customary and statutory land tenure systems that govern the use and management of land and natural resources today.

Complex histories and transboundary dynamics

Each country has a troubled post-independence history for unique reasons. Liberia has suffered a coup d'état and two civil wars since 1980, which then spilled over into a decade-long civil war in Sierra Leone in 1991, as well as a refugee crisis in Guinea. Notably, the transboundary region was also the epicentre of the 2014 Ebola outbreak, which has had a lasting impact upon those most affected, namely smallholder farmers and their families across the region.

Modern historical context

The three Transboundary countries have had intertwined modern histories (Højbjerg, 2010) however, the colonial backgrounds of these countries are quite different, and these differences remain evident today within national political structures and cultural history. Both Sierra Leone and Liberia experienced unique waves of colonialism. Guinea, as part of colonial French West Africa, has little in common with either of the Anglophone countries in terms of early political structures, though cultural similarities descended from the ethnic groups originally inhabiting the landscape persist (Murphy, 2010). For example, the Kissi are the dominant ethnic group in Guinea Forestière, and are also resident in the transboundary landscape of Sierra Leone and Liberia; the Loma of Liberia and those of Guinea descend from the same ethnocultural group; the Kpelle of Guinea are most closely related to the Mende of Sierra Leone, and the Malinke of Guinea are related to the Mandinka of Liberia (Minority Rights Group International, 2020).

Sierra Leone became a protectorate of Britain following British abolition of slavery, with the Crown establishing Sierra Leone as a resettlement colony for former captives of the Atlantic slave trade, with approximately 80,000 former captives being resettled and emancipated in the courts of Freetown by 1871. The American Colonization Society did similar in Liberia sending approximately 13,000 formerly enslaved emigrants from America to Liberia between 1820 and 1867 (US Library of Congress, 2021). In both countries, the influx of emigrants led to cultural conflicts with indigenous inhabitants of the land that persist to this day. The westernised emigrants, who arrived with relationships and status with the governing powers, led to the creation of a political elite in each country dominated by these emigrants and their descendants, a division which persists to some degree to this day (Vinck et al., 2011).

In 1971, The Mano River Union (MRU) was established between Sierra Leone and Liberia, with the goal of technical and economic cooperation, and in 1980 Guinea joined the MRU. However, events arising within a decade of the signing of the MRU made technical and economic progress impossible for any of the states involved, to the extent that it became a forgotten and disused document until it was revived in 2004, with the addition of Côte d'Ivoire as a signatory (Sawyer, 2004).

The Mano River Wars and Ebola

It is difficult to discuss the socio-economic context in the Transboundary area of Guinea, Liberia and Sierra Leone without understanding the gravity of events that took place during the 1990's. Between 1989 and 2003, the heavily forested Transboundary Landscape was a zone of conflict between groupings of rebels, secret societies and government forces in Liberia and Sierra Leone in what are now known as the Mano River wars¹.

During the First Civil War (1989-1997), the rebel National Patriotic Front of Liberia (NPFL) moved through Liberia from Mont Nimba to Monrovia with the aim of toppling the government. The leader of the NPFL, Charles Taylor, was elected president of Liberia, marking the end of that war. Seven years of civil war left over 200,000 Liberians dead, millions displaced, and millions traumatised. In 1999 Liberia's second civil war officially began when a rebel group from Northern Liberia (Liberians United for Reconciliation and Democracy), laid siege to Monrovia in an attempt to overthrow Taylor and regain control of the government². The second civil war was declared over when Taylor stepped down from the presidency in 2003.

The emergence of the civil war in Sierra Leone in 1991 closely paralleled the events of Liberia, linked to the provision of funding and military support from the NPFL to the newly formed Revolutionary United Front (RUF) rebel group in Sierra Leone. Destabilisation caused by the unsuccessful attempt of the RUF to overthrow the government of Sierra Leone impacted the economy significantly, especially the diamond sector, precipitating the instability that led to a coup d'état in 1992. Rebel forces quickly spread throughout the country, especially to those areas rich in natural resources such as alluvial diamonds. Access to the diamond fields provided the main funding for Sierra Leone's 10-year civil war, as well as the continuation of the Liberian civil wars (Vorrath, 2018). Due to their small size and high value per carat, large amounts of value can be smuggled and exchanged globally via diamonds, without being subject to scrutiny (or taxes), and thus the concept of 'conflict diamonds' became recognised globally.

While Guinea was not formally involved in the Mano River wars, proximity, porous borders and the sheer number of refugee claimants moving across international borders in search of safety also implicated and impacted Guinea heavily (Box 1). Approximately 1.4 million people entered Guinea via land borders with Sierra

¹ While the three civil wars occurring within this time period and in this landscape had similar origins, the Mano River wars were Sierra Leonean and Liberian civil wars being fought semi-simultaneously and in close proximity, rather than a single international war.

² The sitting Liberian president at that time of Taylor's coup, Samuel Doe, had himself taken over in a bloody coup in 1980. Doe had been relatively popular in the rural parts of Liberia, as his coup had ended 133 years of political domination by the resettled former captives and their descendants, (called Americo-Liberians), and put it back in the hands of indigenous Liberians.

Leone and Liberia during the wartime period, with about 260,000 being housed by formal camps. Many or most of the remaining refugees survived by living off the land within the dense forests of the Transboundary Landscape (Cavanagh, 2018).

BOX 1: ENVIRONMENTAL IMPACT OF REFUGEE CAMPS IN GUINEA

The mass influx of refugee claimants into Guinea during the Mano River wars contributed significantly to the environmental degradation of Guinée Forestière.

“Guinea Forestière, in specific the areas of Forecariah, Nzérékoré, Macenta and Guéckédou, are clearly characterised by signs of environmental degradation. Especially evident is the visible destruction of the natural forest cover in areas of highest refugee densities, such as the Guéckédou area. It is widely accepted that the overall degradation of the environment is caused by a high demand for natural resources such as arable land, forest wood, and water.”

UNEP (2000)

Conflicting land management values emerged during this time, as the United Nations High Commissioner for Refugees (UNHCR) encouraged refugee farmers to develop wetlands for rice cultivation due to food shortages, while the United Nations Environment Programme (UNEP) decried the biodiversity loss that was resulting from the increased conversion of land to agriculture (UNEP, 2000). This fundamental conflict, between the food security needs of a growing human population and biodiversity conservation, is characteristic of the Transboundary landscape.

The Transboundary Landscape then experienced a decade or so of relative calm and stability, until 2014 when the West African Ebola Virus Disease (EVD) outbreak emerged near the Guinean town of Guéckédou, located within the Transboundary Landscape. Approximately 28,600 people were infected with the disease and approximately 11,300 died. The zoonosis of EVD likely from bats to humans has been determined to have been a direct result of forest fragmentation and increased human presence within forested areas (Rulli et al., 2017), and thus a thread can be drawn through the landscape’s modern history: the arrival of westernised emigrants into both Liberia and Sierra Leone led to political and social divisions with indigenous inhabitants of the land, which persisted for over a century until tensions exploded into a series of political coups and civil wars. These conflicts, in turn, displaced millions and led to large-scale deforestation and human forest presence in neighbouring Guinea, eventually leading to the emergence of EVD.

Today, there is peace in all three countries, each with a democratically-elected president. Notably, all three countries have handled the emergence of Covid-19 admirably (Maxmen, 2020; Varagur, 2020), building on lessons learned from the EVD. Many of the conditions which have led to instability in the past remain, however, including institutions and an impoverished rural population.

Despite each country making progress towards development targets in recent years, Guinea, Liberia and Sierra Leone all remain near the bottom of the United Nations Development Programme’s Human Development Index (HDI), which takes into account factors such as life expectancy, levels of education and per capita income. As of the 2020 HDI ranking, all three countries are clustered in the bottom echelon, with Guinea at 178 (of 189), Liberia at 175 and Sierra Leone at 182 (UNDP, 2020). Gender Development Index scores of 0.806 (Guinea), 0.890 (Liberia), 0.884 (Sierra Leone) indicate low equality in HDI achievements between women and men (UNDP, 2020).

Customary and statutory land tenure systems

Decision-making relating to how land and natural resources are accessed, used and managed occurs at multiple scales through formal and informal governance systems involving a range of institutions.

In all three countries, customary and statutory land tenure systems co-exist and whilst this does not in and of itself pose problems, a lack of connection between the systems can cause a lack of clarity that lead to grievances (Stickler, Mercedes M.; Huntington, Heather; Ewing, 2018). One potential consequence is overlapping and, in some cases, conflictive land and natural resource rights (e.g. mining or logging rights prioritised over pre-existing tenure).

Tenure-related grievances can be exacerbated by the fact that statutory authorities recognise certain communal land rights, but not others (FAO, 2012). Although individual customary systems may differ in their details, the fundamental differentiation between customary and statutory tenure systems in the Transboundary Landscape is *who* has decision-making authority over specific areas of land. Under Liberian statutory law, for example, ownership is established, and land is transferred via economic transaction with statutory approval, whereas under customary tenure, ownership is established by ancestry and inheritance, and overseen by heads of household/family and, if needed, village authorities; equivalent systems are in place under Guinean and Sierra Leonean law.

The difference between tenure systems is immediately apparent when considering immigration into a town or village; under statutory tenure an immigrant would have the right to purchase any land available for sale, provided they have the funds to pay for it. However, because land belongs to the descendants of the elders who once owned the land under customary tenure, ownership is not possible for immigrants to the area; land use rights can be granted, but the land ownership remains with the descendants of the elders. As a result, non-owners with land-use rights are permitted to use the land with certain restrictions. For example, perennial crops may not be farmed on unowned land in Guinea, Liberia or Sierra Leone, as these 'life crops' represent a step on the path to claiming land ownership under customary tenure (Unruh & Turray, 2006; Evans & Griffiths, 2013).

Section 4.2 provides more detailed insight into customary governance at the village level in Guinea Forestière, and the different ways this influences land and natural resource use.

Species and ecosystems

The landscape is situated within the Upper Guinean Forest subregion of the Guinean Forests of the West Africa Biodiversity Hotspot which is a **global priority for primate conservation** due to high levels of endemism (92% of the hotspot's 30 primate species are endemic) and a high level of threat (IUCN & UNEP-WCMC, 2015; Conservation International, 2017). Almost half of the Upper Guinean rainforest of West Africa is situated within Liberia; Guinea contains 6% and Sierra Leone 4%, largely contained within the Transboundary Landscape area (USGS, 2020).

The forests of the landscape are classified as Western Guinean Lowland forest – **one of the most threatened ecoregions in Africa** (Brugiere & Kormos, 2009). They form the most westerly tropical rainforest block on the continent. The topography is largely lowland Guineo-Congolian evergreen rainforest habitat, with the highland areas (over 500m elevation) comprising Guineo-Congolian semi-deciduous rainforest and mesic woodland-grassland mosaic on the highest slopes. The Upper Guinean Forest ecosystems (hyper wet, wet, and moist evergreen forests, and moist semi-deciduous forests) could be considered “endangered” or even “critically endangered”, given their drastic decline of approximately 85% of the original vegetation in some parts of the region (Johnson, 2015).

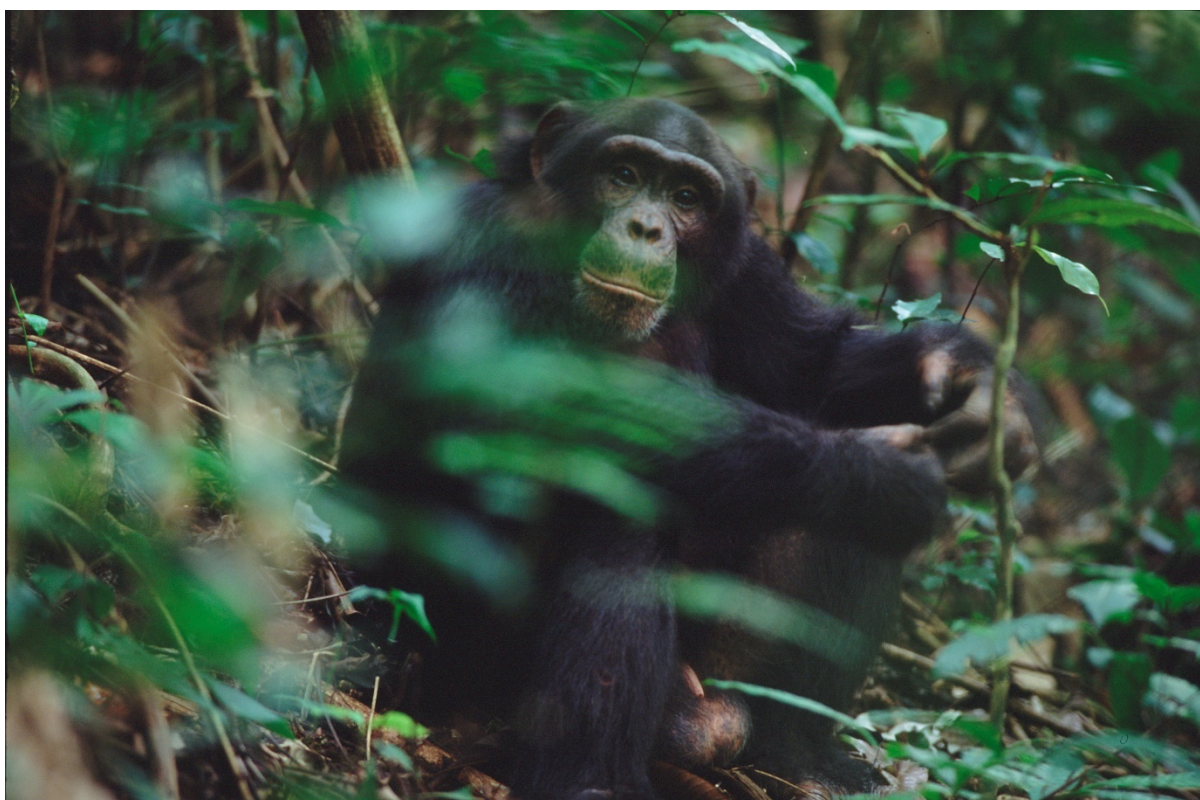


Figure 3 Montane forests of Mount Nimba and the IUCN red listed Critically Endangered western chimpanzee. Credit: Jeremy Holden/FFI

The landscape supports important **populations of globally threatened and iconic species**. Based on the IUCN Red List database, this includes at least the following terrestrial species:

- 9 Critically Endangered: e.g. western chimpanzee (*Pan troglodytes verus*) threatened by hunting and habitat loss resulting in the excessive decline of most of its populations; Mount Nimba viviparous toad (*Nimbaphrynoides occidentalis*) which is known only from the Mount Nimba region in Guinea, Côte d'Ivoire and Liberia; slender snouted crocodile (*Mecistops cataphractus*).
- 21 Endangered: e.g. Diana monkey (*Cercopithecus diana*) – an important indicator species for forest health because of its dependence on high-canopy forests; pygmy hippopotamus (*Choeropsis liberiensis*); Jentink's duiker (*Cephalophus jentinki*); the endemic western red colobus (*Piliocolobus badius*); king colobus (*Colobus polykomos*); Tai toad (*Amietophrynus taiensis*); white-bellied pangolin (*Phataginus tricuspis*); giant ground pangolin (*Smutsia gigantea*).
- 34 Vulnerable: e.g. forest elephant (*Loxodonta Africana*); sooty mangabey (*Cercocebus atys*); zebra duiker (*Cephalophus zebra*); Nimba flycatcher (*Melaenornis annamarulae*); yellow-casqued hornbill (*Ceratogymna elata*); rufous fishing-owl (*Scotopelia ussheri*); Aellen's roundleaf bat (*Hipposideros marisae*); olive colobus (*Procolobus verus*); black-bellied pangolin (*Phataginus tetradactyla*).

The western chimpanzee (Figure 3) is estimated to have declined by 80% in the period 1990-2014 resulting in its geographic range contracting by 20% (Kühl et al., 2017), a trend that will continue if no action is taken to curb the threats to its survival. Guinea, Liberia and Sierra Leone hold important populations of western chimpanzees and the Transboundary Landscape includes four transboundary areas identified as being particularly important for conservation of the species – see also Section 2.3 (Heinicke et al., 2019b; IUCN SSC Primate Specialist Group, 2020).

The Guinean Mount Nimba Strict Nature Reserve (Figure 3) has recently been found to hold the **highest number of threatened plant species** (58) in Guinea and is among 22 areas in the country declared as official 'Tropical Important Plant Areas' covering more than 60% of the 273 threatened species in the country (Royal Botanic Gardens Kew, 2019). Recent surveys in relatively unexplored areas including in Guinea Forestière have contributed to the discovery of new plant species records including species new to science and all threatened with extinction.

Parts of the landscape are associated with **high species richness and endemism as well as holding important populations of globally threatened species**. Gola Rainforest National Park, for example, which straddles the Sierra Leone – Liberia border, is estimated to contain 80% of all 750 species currently known from Sierra Leone (IUCN & UNEP-WCMC, 2015). Whilst in the transboundary Zياما-Wonegizi-Wologizi (ZWW) forests of Guinea and Liberia ongoing eDNA³ studies are revealing high species diversity including a total so far of 112 taxa including 53 unique fish, 12 amphibians, 18 birds and 29 mammals (FFI & NatureMetrics, 2020). Species of note include the IUCN Red Listed Critically Endangered western chimpanzee, Endangered white-bellied pangolin and Baer's wood mouse, Vulnerable carp, red spotter panchax, and Zياما torrent-frog, and the Near Threatened African clawless otter, African straw-coloured fruit-bat, dark-brown serotine, bay duiker, and spotted-necked otter. Camera trapping is also ongoing across the landscape (Figure 4).

³ eDNA is nuclear or mitochondrial DNA that is released from an organism into the environment. It is an innovative method of biodiversity monitoring that is increasingly providing vital insight into species diversity and is a particularly valuable tool in forest habitats where species often elude direct monitoring.



Figure 4 Camera trap photographs gathered as part of ongoing biodiversity surveys indicate high mammalian diversity in the ZWW landscape. Species depicted: A: Cape clawless otter; B: diana monkey; C: western chimpanzee; D: pygmy hippopotamus; E: red river hog; F: ogilby's duiker; G: African civet; H: white-bellied pangolin; I: sooty mangabey; J: zebra duiker. Credit: FFI, Forest Development Authority (Liberia) and Centre Forestière de N'Zérékoré (Guinea).

High levels of endemism are associated with the humid mountainous zones with rare montane and sub-montane forest habitats considered regionally outstanding and an Afromontane archipelago-like regional centre of endemism; serving as critical “forest refugia” for endangered and endemic species. Mount Nimba, for example, supports endemic fauna such as the Nimba otter shrew (*Micropotamogale lamottei*)⁴ and the Mount Nimba viviparous toad (*Nimbaphrynoides liberiensis*) and is among the 14 centres of plant endemism in the Upper Guinean biodiversity hotspot. Endemism is also high among freshwater taxa.

The landscape includes 14 Key Biodiversity Areas⁵ and the Mount Nimba World Heritage Site, of which over 70% (12,540 ha of 17,540 ha) is located in Guinea with the remainder in Côte d'Ivoire. These designations are indicative of the high significance of this landscape for global biodiversity conservation.

Ecosystem services and sociocultural values

The landscape's forests and other natural and agro-ecosystems provide **essential ecosystem services for a range of beneficiaries** from local communities and land users to the global population (Table 1). The landscape's natural ecosystems provide a range of essential provisioning services (e.g. as sources food, energy, water, building materials) with associated subsistence, income generating and cultural uses and values for local communities. Land and natural features in the landscape (forests, trees, individual species) also form an important part of cultural identity.

The landscape's forests underpin important regulating services sequestering and storing carbon, acting as windbreaks protecting crops and communities and providing watershed protection, erosion prevention and soil fertility maintenance. In the Transboundary Landscape, the north-west forests of Liberia are one of few remaining areas of intact forest and are critical for carbon storage and are reported to have some of the highest density of aboveground biomass carbon of any forest in the world (Conservation International, 2017). Natural ecosystems in the landscape help to maintain soil quality, pollinate crops, regulate pests, and regulate local microclimate with benefits for agriculture. Wildlife can also generate disservices through, for example, acting as agricultural pests and damaging crops (e.g. various insects and birds, chimpanzees, elephants).

Across the landscape, many local communities have strong **cultural identity and sociocultural values associated with forests, landscape features and nature**. These may be tangible such as the collection of forest products for ritual purposes (e.g. raffia used in making apparels for traditional ceremonies) or intangible (non-use) such as certain parts of the natural landscape (e.g. rivers, mountains, waterfalls) being considered the dwelling places of deities or genies (in parts of Guinea), (FFI & The Proforest Initiative, 2012; World Bank, 2019a). Other examples include ancestral burial grounds, sacred groves or forests, and areas used for rituals. Individual plant or animal species may be valued and culturally protected as totems. For example, birds are at the heart of many customs and traditions of various ethnic groups in Sierra Leone, including as cultural symbols, food and in traditional folk medicine. White-necked picathartes breeding sites, for example, are recognised as sacred because some indigenous tribes in the southeast considered these birds as embodiments of ancestral spirits (Okoni-Williams et al., 2014). Cultural taboos have also been linked to the persistence of certain threatened species in some parts (e.g. taboos on hunting chimpanzees - Heinicke et al., 2019c).

Cultural and traditional practices associated with the natural landscape and practices vary among different ethnic groups as well as from place to place, even within the same county, prefecture, region or other administrative.

⁴ Endemic to a small region of West Africa: the Nimba Mountain of Liberia, Guinea and Côte d'Ivoire, and the Wologizi and Putu mountains, Liberia

⁵ Key Biodiversity Areas include: for Guinea, the Massif du Ziama, Diecke, Béro, Pic du Fon, Mount Nimba (part of the Mount Nimba Transboundary Alliance for Zero Extinction); in Liberia, the Wonegizi Mountains, Wologezi Mountains, Lofa-Gola-Mano Complex, Kpelle Forest, West Nimba and Nimba Mountains; and in Sierra Leone, Gola, Kambui Hills, Tingi Hills and Loma Mountains.

Table 1 Ecosystem services of the Transboundary Landscape. Adapted from IUCN & UNEP-WCMC (2015)

ECOSYSTEM SERVICE TYPE	ECOSYSTEM SERVICE DESCRIPTION AND SOURCE	BENEFICIARIES
Regulating services	<ul style="list-style-type: none"> • Climate change mitigation through carbon storage and sequestration provided by the landscape’s forests. • Sediment retention, erosion prevention and maintenance of soil fertility provided by forest and other vegetation cover. • Watershed protection. Forests provide catchment protection, driving the water cycle, regulating water flows, protecting water quality, and maintaining aquatic habitats. • Microclimate regulation by forests (including as a windbreak⁶). • Flood regulation: functioning wetlands buffer the rise and fall of flood waters. • Pollination by insects and some birds and bats. Pollinators in agroecosystems. • Biological control of populations of potential pests and disease vectors. 	<ul style="list-style-type: none"> • All humankind. • Communities within landscapes. • Local communities. Major ecosystem service values from water realised in areas outside focal landscape where there is less rainfall. • All residents and land users. • Local communities and land users, including downstream users and fisheries. • Local communities and land users. • Local communities and land users.
Supporting services	<ul style="list-style-type: none"> • Forests and freshwater ecosystems support high levels of biodiversity and endemism. 	<ul style="list-style-type: none"> • All humankind.
Provisioning services	<ul style="list-style-type: none"> • Wild fauna and flora for food and medicine (subsistence use, income, cultural value). • Timber extracted for use in building, energy (firewood), and industries (subsistence and/or commercial). • Water originating from forests and used for drinking, washing, irrigation, industrial use, energy generation and fishing. • Fishery in freshwater systems 	<ul style="list-style-type: none"> • Rural communities and some urban areas. • Local communities and national economies. • All residents and land users in the landscape. Highly important in landscape and throughout drainages. • All residents in landscape.
Cultural services	<ul style="list-style-type: none"> • Ecotourism opportunities. • Research and education. • Cultural identity and sociocultural values. 	<ul style="list-style-type: none"> • Local, national and international tour operators and tourism infrastructure support staff. • National, regional and international research and education institutions. • Local community.

⁶ Areas left for windbreaks and watershed protection on community forest lands, as components of the protected forest areas, are recognised in Liberian Law.

2.2 Current state of biodiversity

Conservation area network

The landscape comprises formally protected areas with a biodiversity conservation mandate and 29 forests recognised in national legislation (i.e. forest reserves (hunting permitted) in Sierra Leone, classified forests in Guinea, and proposed protected areas in Liberia) that do not necessarily confer protection for biodiversity at present (Figure 5). Many of the protected areas, proposed protected areas and classified forests connect important transboundary forests. The Ziama Man and Biosphere Reserve (MAB)⁷, for example, is contiguous with transboundary forests in Liberia (Wonegizi, Wologizi and Foya Proposed Protected Areas, and the Gola National Park – IUCN Category II) and connected via Liberia to the forests of Sierra Leone (Gola Rainforest National Park – IUCN Category II).

To the east, the Mount Nimba Biosphere Reserve⁸ is contiguous with transboundary forests in Côte d'Ivoire and Liberia. In Guinea and Côte d'Ivoire, Mount Nimba is a Strict Nature Reserve (IUCN Category Ia) and World Heritage Site whilst adjacent forest in Liberia is managed in the East Nimba Nature Reserve (IUCN Category IV). In the far northwest of the landscape the Tonkoli-Tama Forest Reserve, Loma Mountains National Park (IUCN Category II) and Tingi Hills Non-Hunting Forest Reserve in Sierra Leone are recognised under varying designations, though Tonkoli-Tama may offer limited protection to wildlife as hunting of certain species can be permitted under licence in Forest Reserves.

There are 15 Classified Forests in the Guinean part of the landscape including Dieke (59,100 ha); Mont Bero (26,800 ha); Pic de Fon (25,600 ha within the Simandou hills); and Mont Yonon (7,293 ha). According to the Forest Code, classified forests are dedicated forest areas for present and future generations. Classified forests receive some protection in law, but that protection does not necessarily include biodiversity conservation. Classified forests are not recognised as protected areas but classified forest status should facilitate the change into formal biodiversity protected areas (IUCN category I–IV) (Brugiere & Kormos, 2009). Currently only two of the designated forests in the Guinea Forestière part of the Transboundary Landscape are formal protected areas (Ziama MAB and Nimba Strict Nature Reserve and WHS), three have management plans in place (Ziama, Nimba and Pic du Fon) and none have long-term financing to support their management and the conservation of the biodiversity and ecosystem services values they support.

There are five proposed protected areas in the Liberia landscape (Foya, Kpo, Wonegizi, Wologizi and the West Nimba Forest) which have all been identified to support the expansion of the protected areas network and secure forest connectivity within Liberia and with contiguous transboundary forests (Figure 5). Proposed Protected Areas are recognised in law and the formalisation of these forests as protected areas under various management categories is ongoing with Wonegizi the closest to gazettelement as a Multiple Use Reserve; a process that is being advanced alongside a pilot REDD+ project.

⁷ 119,019 ha core and buffer with an unofficially designated 118,200 ha of transition zone.

⁸ In Guinea, the Mount Nimba Biosphere Reserve extends over 145,200 ha and includes the Nimba Strict Nature Reserve WHS as well as the Bossou Hills and Dere Forest but also includes a largely deforested transition zone of 88,280 ha.

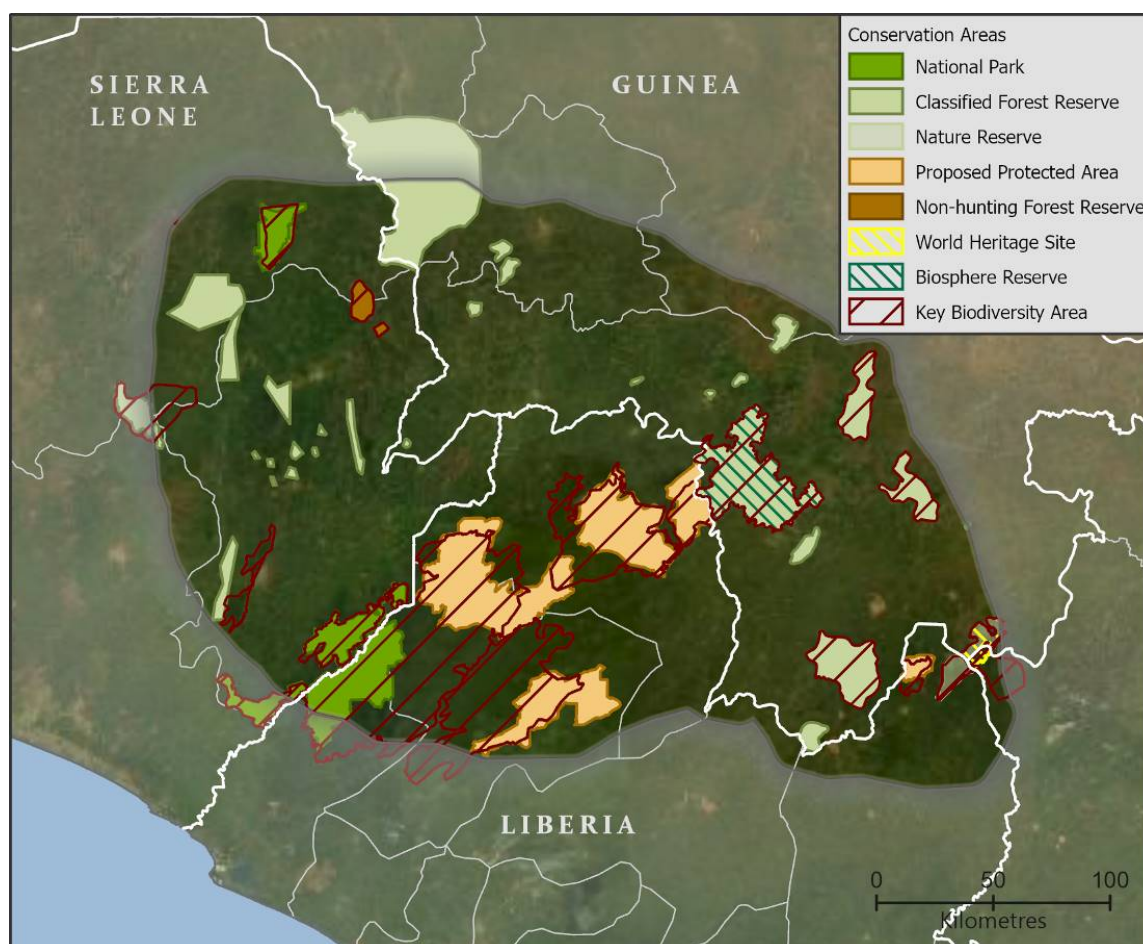


Figure 5 Map of conservation areas, excluding community forests and sacred forests for which spatial data is not available across all countries.

Community forests and sacred forests exist across the landscape and are recognised in law by all three countries. In Liberia, 'Traditional Protected Areas' are explicitly recognised, including reference to 'Bush schools', 'Sacred Society Bush', and 'Ancestor Homes' (Government of the Republic of Liberia, 2016). Community forests on non-state land are governed and managed by a community. In the case of Liberia, the stated purpose, as reflected in the National Wildlife Conservation and Protected Area Management Law is both "for commercial and non-commercial purposes to further development of the community and enhance livelihoods of community members" (Government of the Republic of Liberia, 2016). The Community Rights Law with respect to Forest Lands (CRL), was passed in 2009, and this law and its implementing regulations provide the basis for recognition and regulation of community forests in Liberia.

Community forests on state land ultimately falls under the respective forest management authority. In Sierra Leone, this would be the Forestry Division unless other arrangements are agreed with the Forestry Division. Sacred forests constitute a distinct category of community forest recognised in law. For example, in Guinea, sacred forests are defined as a 'wooded area reserved for the sociocultural expression of a given community and whose access and management are regulated' (MEEF, 2018).

These forests play an important role in shaping and conserving tropical forest and its biodiversity (see Box 2) and in Guinea, despite widespread forest loss, community forests persist as forest islands across the country (CILSS, 2016). Moreover, whilst there is little ecological data available regarding Guinea's sacred forests, recent studies indicate that these forests support high ecological diversity and have an important role in forest conservation, particularly in a local context of strong human impacts (CILSS, 2016; Soumah et al., 2018).

Sacred forests are protected and maintained through a combination of taboos, prohibitions, shared beliefs and socially-enforced restrictions (Fahey, 1971). The governance of sacred forests rests with the secret societies who use them, which is determined locally according to customary law. The cardinal rules involve gender separation and not disclosing activities to outsiders.

“Sacred natural sites are almost certainly the world’s oldest form of habitat protection.”

Dudley et al. (2009).

The importance of avoiding impacts to sacred forests and supporting and strengthening their protection and that of other community managed forest areas has been recognised by industry operators in some sectors in the region within their respective impact mitigation plans (e.g. in the Boké and N’Zérékoré regions in Guinea).

BOX 2: SACRED GROVES IN LIBERIA AND THEIR ROLE IN SHAPING TROPICAL FOREST BIODIVERSITY

For many societies of sub-Saharan Africa ancestors are present and have social roles in the world of the living. Sacred groves are of ritual and religious importance to particular cultures that in turn confer protection to the culturally valuable tree species they harbour (Fraser et al., 2016 and references therein). Fraser et al. assessed the distribution of regionally specific ‘sacred agroforests’ – spaces that are associated with Mande macro-language speaking groups such as the Loma, for whom sites are ritually and symbolically associated with ancestors through graves and certain trees. As a result, clear cutting and burning these sites is strictly forbidden in customary law, thereby conserving plants and trees growing on them. However, these areas are still used for the cultivation of tree crop species, where this can be done without disturbing large, mature emergent rainforest species and without the need for burning – namely through agroforestry practices. The historic practice and use of these areas as agroforests has created soils rich in organic carbon. Sacred agroforests are widespread throughout the Upper Guinean forest of north western Liberia, southern Guinea and Sierra Leone. Over time, these traditional practices of clearance and use, protection and forest regrowth, and eventual abandonment have shaped the area’s tropical forest biodiversity.

Forests

Across the landscape overall, an estimated 3.85 million ha are extant forest habitat, which represents approximately 65% of the focal landscape extent. Around a quarter of forest areas have canopy cover of 75-100% with the majority (about half) of forest areas have canopy cover of 50-75% (Figure 6). Over half the total forest area has tree heights exceeding 10 metres, however, almost **80% of forest in the landscape is exposed forest edge habitat⁹** – meaning the extant forest is fragmented and the forest blocks have experienced encroachment that has increased the exposed forest edge.

⁹ Edge: Habitat that is at the perimeter of extant forest patches and is exposed to non-habitat classes. In this case study, the edge boundary was set at 200m which represents the absolute limits of threats and exposure from non-habitat areas that habitat within a forest patch might be subjected to. The edge class consists of all the exposed forest habitat classes within this buffer distance, in addition to any connecting bridge habitat between forest patches that is less than the buffer distance or any perforations or incursions within core habitat areas. For the purpose of application in this case study, edge habitat represents forest habitat that has been degraded due to threats and pressures emanating from non-habitat areas and any ecotone or transition forest habitat that may not be representative of its associated forest ecosystem type.

The **distribution of intact forest habitat is uneven across the landscape**. The greatest extent of core forest habitat¹⁰ comprising at least 50% canopy cover and trees over 10 m tall is located in Liberia where relatively intact forest exists in a nearly contiguous block via a network of existing and proposed protected areas and legally authorised community forests (managed under Community Forest Managed Agreements), connected by communal and national forest land and extending over the borders into Guinea (through Ziama) and Sierra Leone (Gola). This area of intact forest is recognised for its very high forest carbon, biodiversity value, freshwater provision and sediment regulation (e.g. Conservation International, 2017a, 2017b; Pollini et al., 2018; FFI 2020a and supported by ongoing biodiversity monitoring led by FFI, CFZ and FDA).

Most of the remaining larger patches of core forest habitat are contained within classified forests (Guinea), **forest reserves** (Sierra Leone), **protected areas** (present but few in number across all three countries) and the Lofa-Gola-Mano, Kpelle, and Wologizi Mountain forests in Liberia – the majority of which fall within identified **Proposed Protected Areas** (Figure 8a & Figure 9a & b). These core forest patches exist within a mosaic landscape dominated by agroecosystems and forest fragments (comprising edge forest habitat). Outside of designated forests in the Guinean and Sierra Leone parts of the landscape, forest habitat is mostly under 50% canopy cover, with tree height under 10 metres. Finer scale land cover analysis conducted for the Ziama-Wonegizi-Wologizi forests shows that cleared land within the agricultural mosaic occurs right up against areas of relatively unbroken forest, creating numerous sharp transitions (see FFI, 2020a and Figure 7).

According to Global Forest Watch data, between 2001 and 2019 the total area of forest decreased by 19% across the Transboundary Landscape area, with forest loss occurring across the landscape. At this scale, it is evident that in both Guinea and Liberia forest loss appears to have occurred primarily outside of protected areas, proposed protected areas and classified forests (Figure 8b) which may become increasingly isolated if deforestation trends continue unabated.

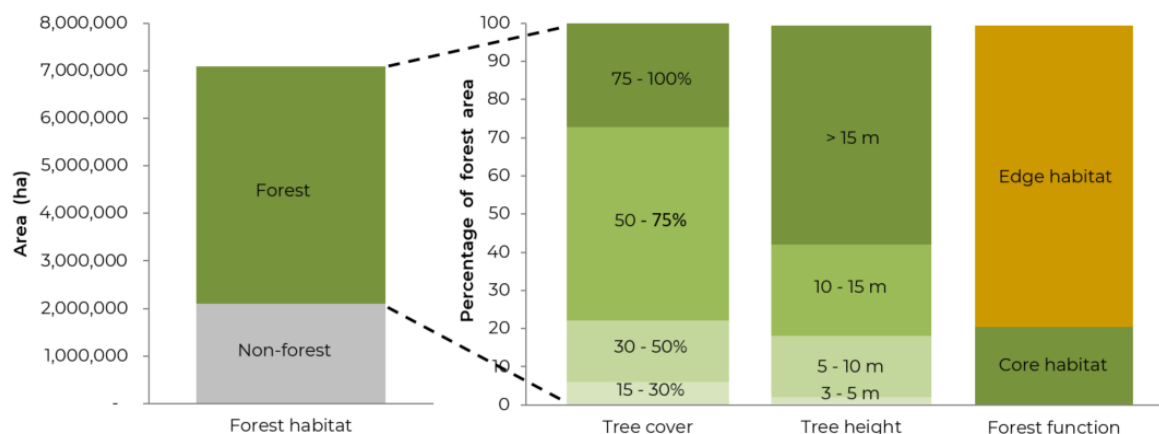


Figure 6 Graph showing total area of forest habitat, percentage tree cover, tree height and forest function

¹⁰ **Core:** Habitat that is contiguous and is the interior area of an extant forest patch. For the purpose of application in this case study, core habitat represents the extant forest habitat that has not been exposed to threatening pressures and therefore could be considered primary forest habitat of pristine condition which is representative of the forest ecosystem type.



Figure 7 In the Transboundary Landscape cleared and cultivated land occurs right up against areas of relatively unbroken forest. Credit: Elisabeth Villeneuve / FFI.

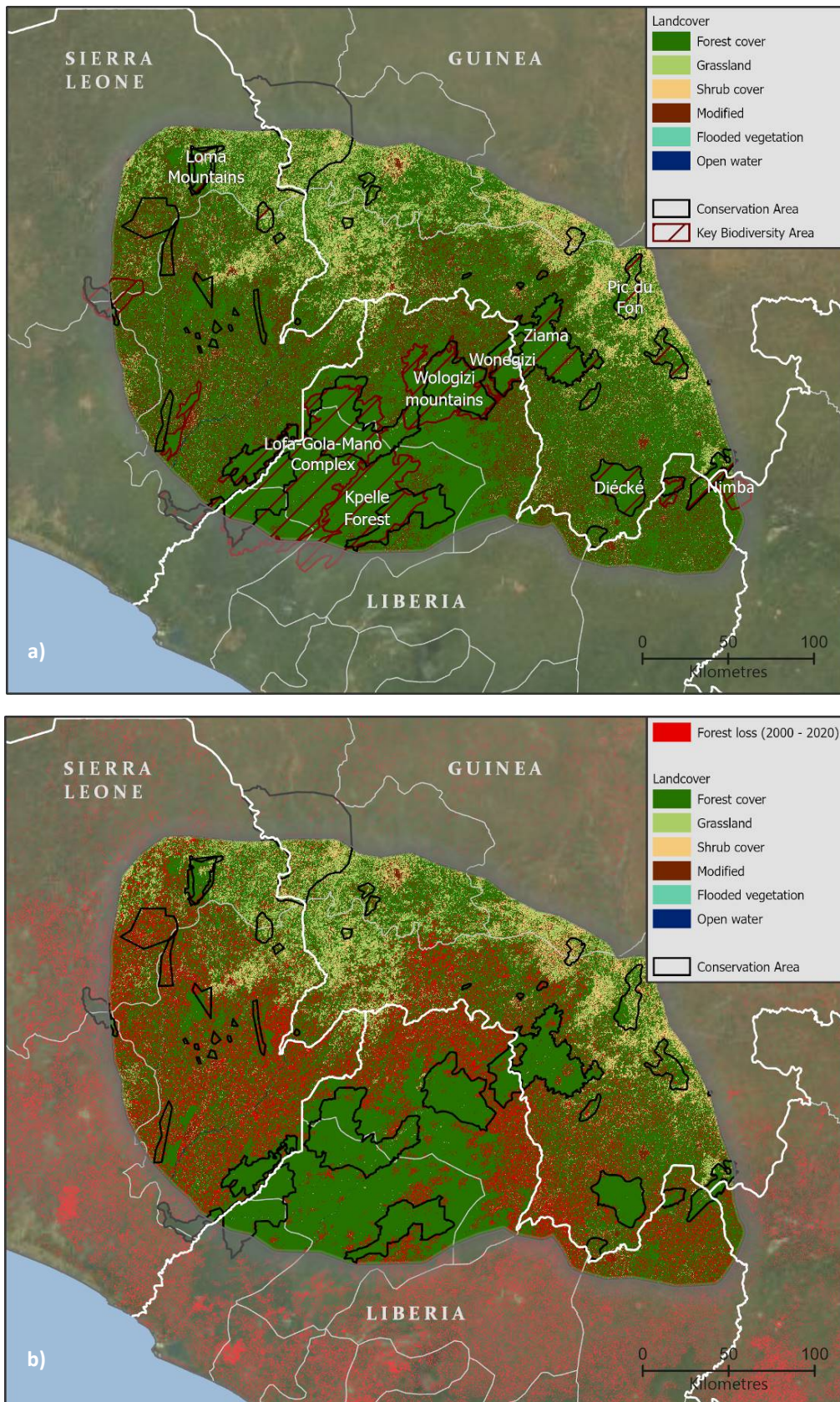


Figure 8 (a) Landcover, conservation areas and key biodiversity areas; (b) Land cover, conservation areas and forest loss 2000-2020

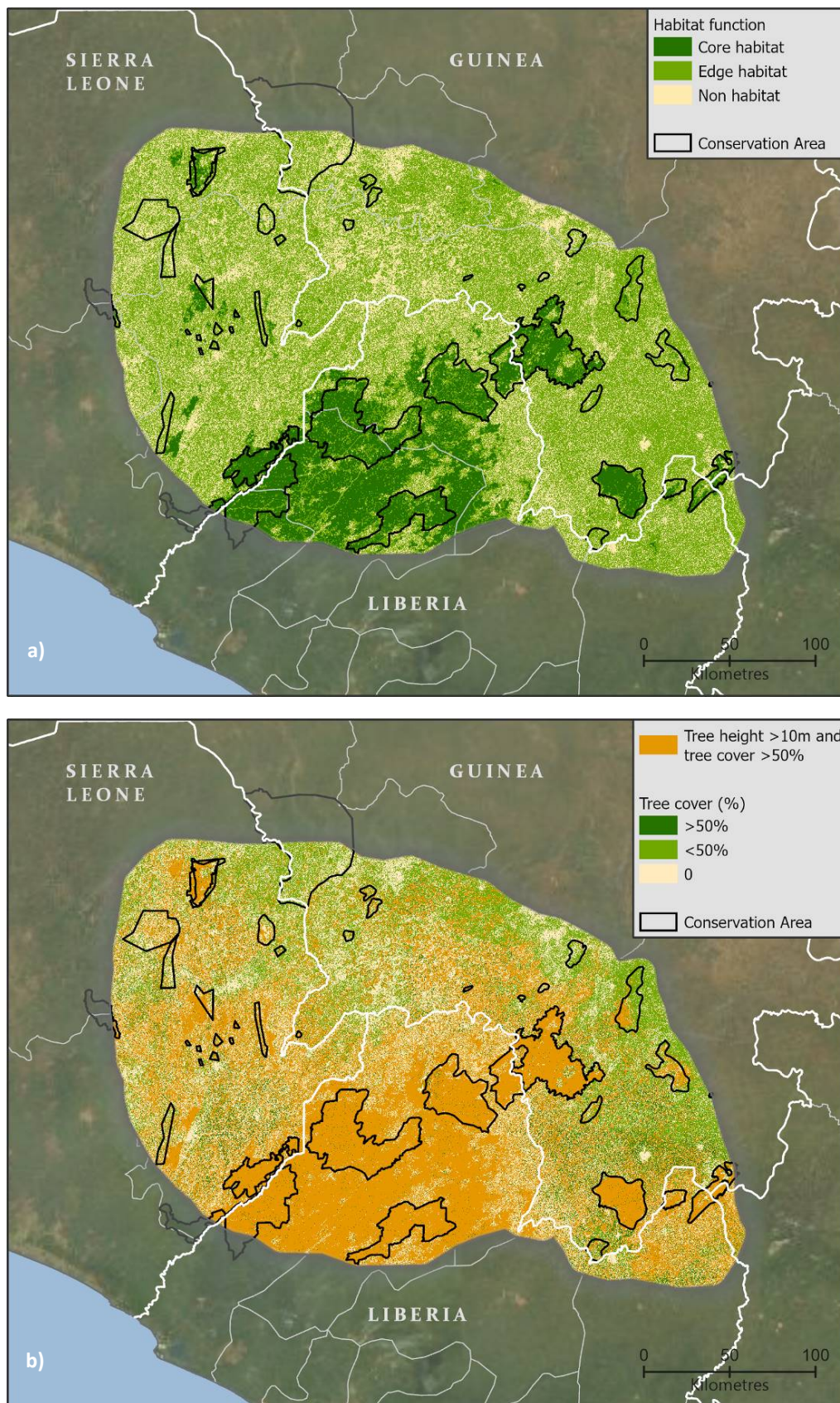


Figure 9 a) Extant forest cover in the focal landscape, with core habitat (dark green) and exposed edge habitat (light green); b) representation of all forest habitat that is at least 50% canopy cover and of minimum 10 m tallest tree height (orange)

Threatened species

For the purpose of this case study, we focus on two species of conservation concern, the western chimpanzee and the African forest elephant. This provides an opportunity to consider the landscape from the perspective of two large mammal species. Forest elephants and western chimpanzees have also been shown to coincide with other threatened mammal species (e.g. Brugiére & Kormos, 2009; Brncic et al., 2015; Tweh et al., 2015).

Across the region, **western chimpanzees** live in a diversity of habitat types including mosaics of forests and agricultural areas though densities are generally lower in mosaic habitats than contiguously forested habitats (IUCN SSC Primate Specialist Group, 2020). A recent systematic region-wide assessment of western chimpanzees by Heinicke et al. (2019a) used a variety of data from surveys and inventories and identified several areas where the modelled density of Western chimpanzee exceeds a predicted five individuals per km² (Figure 10a). As of 2018, only 17% of western chimpanzees occur in protected areas designated as national parks or IUCN Category I or II protected areas, with 83% of the population living outside high-level protected areas (Heinicke et al., 2019b; IUCN SSC Primate Specialist Group, 2020).

Within the focal landscapes, areas where chimpanzee density was estimated to be relatively high includes: Pic de Fon, Mount Nimba, Ziama and Wonegizi forests, Gola and Foya forests, Loma Mountain, and the Tingi Hills and transboundary area north and northwest of the Tingi Hills into Guinea. This finding is generally consistent with the distribution of core forest habitat, with trees over 10 metres tall which are important for nesting (Morgan et al., 2006) and high percentage canopy cover. Kühl et al. (2017) and (Heinicke et al., 2019a) both indicate that there are eight exceptionally stable or high chimpanzee density sites across the West African region including two in the focal landscape: the greater Nimba Mountain region (Côte d'Ivoire, Guinea, Liberia) and Gola National Park (Sierra Leone).

Recent surveys in Loma Mountain National Park (Sierra Leone) have also revealed high chimpanzee densities (Garriga, 2019). These sites are characterised by some combination of low degree of forest loss, steep terrain (e.g. Nimba), research presence, social taboos against the killing of chimpanzees (e.g. Fouta Djallon in north-central Guinea), presence of protected areas, and/or remoteness (IUCN SSC Primate Specialist Group, 2020).

Heinicke et al., (2019a) also identified breaks in the continuity of western chimpanzee populations, which are all located in Guinea and include two areas of low population connectivity in the focal landscape (Figure 10b): the first is at the prefecture of Guéckédou and the tri-national border of Guinea, Liberia and Sierra Leone where forest habitat comprises mostly exposed edge forest with low canopy cover and there are no legally designated forests or protected areas; the second is at the prefecture of Yomou in the south-eastern corner of Guinea Forestière (IUCN SSC Primate Specialist Group, 2020).

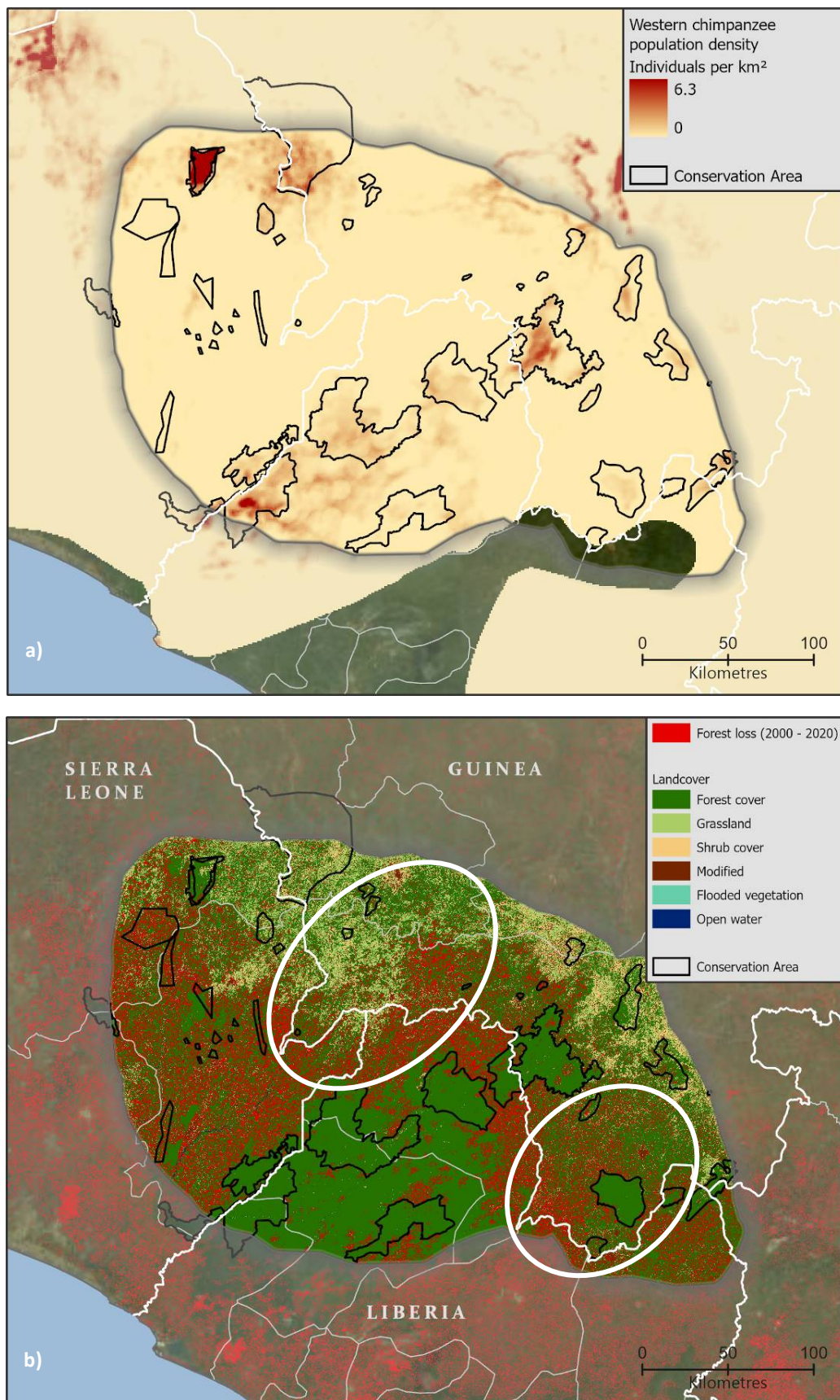


Figure 10 (a) Modelled density of western chimpanzee based analysis by Heinicke et al. (2019a); (b) Land cover, conservation areas, forest loss (2000-2020) and areas (broadly depicted in white) identified by Heinicke et al. (2019a) with low population connectivity for western chimpanzees in the Transboundary Landscape.

Forest elephants are currently classified as a rarer subspecies of African elephant, though some experts argue they might be a separate species; a third West Africa subspecies of elephant has also been suggested (Blanc, 2008). A significant population decline resulting from human forest presence during the Mano River wars has been observed (Lindsell et al., 2011) and an escalation in poaching means that forest elephants are now severely threatened, with numbers thought to be as low as 300 individuals in the region. However, a lack of recent systematic studies makes it difficult to estimate numbers accurately.

The transboundary landscape, extending eastwards into Côte d'Ivoire, provides one of the last viable, intact habitat to support the remaining forest elephants at the western edge of its range. Freeman et al., (2019) modelled the potential current distribution of African forest elephant and the resultant models identified suitable habitat for forest elephant in the lowland forest areas of the Transboundary Landscape (Figure 11). Since 2004, elephant numbers in Zياما have declined from an estimated 214 individuals (Barnes & Awo, 2005) to under 20 individuals (FFI, 2017). Between 2010 and 2016, 22 elephant carcasses were found by Centre Forestière de N'Zérékoré (CFZ) law enforcement patrols. Although no elephants have been poached since 2016, habitat disturbance is thought to be a contributor to their declining numbers and the possibility remains that individuals migrated across the border to Liberia, where they have not been immune to poaching (at least eight elephants have been killed in northwest Liberia in the last five years). Incidents of human-elephant conflict have also been on the increase.

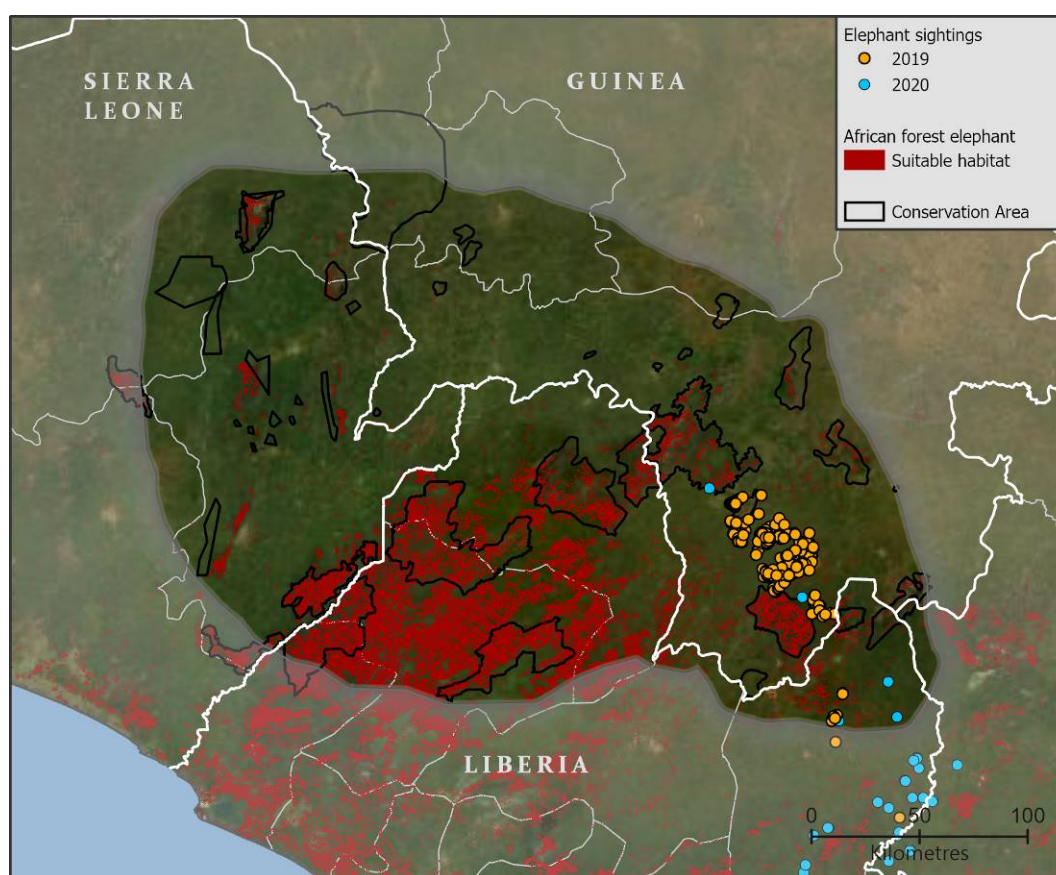


Figure 11 Modelled habitat suitability for forest elephant from Freeman et al. (2019) in red and recent records from the region showing the movement patterns of individual forest elephants from where they reside in the Zياما MAB across the landscape into Liberia and over the border into Côte d'Ivoire (points).

In fact, extraordinary movement patterns of elephants in this landscape have recently been recorded emphasising the importance of connectivity for the persistence of such large, wide-ranging species. The elephants of Ziama have been recorded ranging hundreds of kilometres, moving between classified forests in Guinea Forestière and across borders into Liberia and Côte d'Ivoire using the remaining, tenuous connectivity provided by forest fragments and agricultural land to traverse the landscape (see Figure 11). Ongoing monitoring of the elephants' movements is providing vital insight into forest connectivity from the perspective of a large and wide-ranging mammal.

2.3 Priority areas for conservation and restoration

International commitments

The governments of Guinea, Liberia and Sierra Leone have commitments under international agreements relating to biodiversity, land degradation neutrality, ecosystem restoration, climate mitigation etc. (see Table 2). All three countries have mechanisms within their National Strategies for protecting the biodiversity found within the forested transboundary region, and multilateral support exists for the protection of this significant part of the Upper Guinean rainforest.

In Guinea, for example, alongside a strong focus on economic growth, the Government of Guinea has made commitments to increase protected area coverage to 25% of the country's land area by 2025 and restore 2 million ha of deforested or degraded land under the Bonn Challenge and AFR100 initiative, and has set voluntary targets to advance Land Degradation Neutrality by limiting further loss of non-degraded land, restoration of degraded lands, and increase in forest areas (national target of 1.5% or 150,000 ha) forest reserves relative to a 2010 reference baseline (Global Mechanisms of UNCCD, 2018). In Guinea Forestière, forest reserves and mining zones are identified as priorities for targeted action. The proposed objective to increase forest areas is in line with the country's Intended Nationally Determined Contribution (INDC) under the Paris Agreement.

The protection of species, ecosystems and ecosystem services and their restoration across the transboundary landscape will play a significant role in the delivery of these national objectives. To achieve this, the landscape's forests, biodiversity, and communities must be at the heart of decision-making as it relates to land use and economic development.

Table 2 International and regional conservation commitments

INTERNATIONAL & REGIONAL INITIATIVES AND AGREEMENTS	GUINEA	LIBERIA	SIERRA LEONE
Bonn Challenge: a global effort to bring 350 million ha of deforested and degraded land into restoration by 2030	✓	✓	✗
Land Degradation Neutrality (LDN) Target Setting Programme of the UNCCD	✓	✓	✓
United Nations Convention to Combat Desertification (UNCCD): the sole legally binding international agreement linking environment and development to sustainable land management.	✓	✓	✓
Convention on International Trade in Endangered Species of wild fauna and flora (CITES)	✓	✓	✓
UN Convention on Biological Diversity (CBD)	✓	✓	✓
UN Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Convention	✓	✓	✓
UNESCO Man and Biosphere Programme (MAB): an intergovernmental scientific programme that aims to establish a scientific basis for enhancing the relationship between people and their environments	✓	✗	✗
United Nations Framework Convention on Climate Change (UNFCCC)	✓	✓	✓
UN Agenda 2030 and the SDGs	✓	✓	✓
United Nations Collaborative Programme on Reducing Emissions from Deforestation and forest Degradation (UN-REDD+)	✓	✓	✗
Convention on the Conservation of Migratory Species (CMS)	✓	✓	✓
Ramsar Convention on Wetlands of International Importance	✓	✓	✓
The African Forest Landscape Restoration Initiative (AFR100)	✓	✓	✓
African Resilient Landscapes Initiative (ARLI)	✓	✓	✓
World Bank Africa Climate Business Plan	✓	✓	✓
African Landscape Action Plan	✓	✓	✓
Forest Law Enforcement, Governance and Trade Action Plan (EU FLEGT)	✗	✓	✗
Mano River Union	✓	✓	✓
African Convention on the Conservation of Nature and Natural Resources	✓	✓	✓
Economic Community of West African States (ECOWAS)	✓	✓	✓
International Tropical Timber Agreement (ITTA) and International Tropical Timber Organisation (ITTO)	✗	✓	✗
African Union's Agenda 2063	✓	✓	✓

Conservation priorities and knowledge gaps

The data presented in Section 2.2 support past and ongoing monitoring and prioritisation processes that have identified areas of high conservation and carbon value in the landscape. Yet currently, only four¹¹ of the identified areas that are important for biodiversity conservation, ecosystem services and climate mitigation have protection status equivalent to IUCN Category I or II. Some other forests are being managed for biodiversity conservation, including the Zياما MAB, yet many more whilst legally recognised forests are not formally designated protected areas, and many are not actively managed for biodiversity conservation.

In Guinea, for example, only three forests in the Guinea Forestière landscape (two protected areas and one classified forest) have management plans in place (Zياما, Nimba and Pic du Fon); none have long-term financing to support their management and the conservation of their biodiversity, carbon and other ecosystem service values. Of the remaining Proposed Protected Areas in Liberia, Wonegizi is the closest to gazettelement.

The recent systematic analysis by Heinicke et al. (2019b) identified four transboundary areas in the focal landscape as particularly important for the conservation of the western chimpanzee: **Lofa-Mano-Gola forests, Nimba mountains, Diéke, and the Zياما – Wonegizi forests** (IUCN SSC Primate Specialist Group, 2020). Currently, only Gola National Park, Loma Mountain National Park and Mount Nimba Strict Nature Reserve are IUCN Category Ia and II protected areas in the focal landscape. This assessment is largely consistent with the findings of Kormos & Boesch (2003) with some exceptions (outside of the focal landscape). In the Guinean context, it also aligns with analysis by Brugiere & Kormos (2009) which identified Zياما and Diecke forests as having very high conservation significance such that, if protected, they could provide protection to western Guinean lowland forests and sympatric species, including 11 of the 14 threatened large and medium-sized mammals occurring in Guinea at that time.

Whilst some large forest patches remain in the landscape, notably in Liberia and straddling national borders, evidence also indicates **increasing isolation of core forest patches in Guinea and Sierra Leone, areas of low population connectivity for chimpanzees** (in Guinea – Figure 10) and **tenuous connectivity across a fragmented forest-agriculture mosaic** for wide-ranging species including forest elephants. Identifying areas in the landscape that need to be maintained or, where appropriate and feasible, restored or sustainably managed to maintain functional connectivity for key species and ecological processes is critically important.

Currently, there is a **paucity of data on which to base conservation planning for connectivity** across the landscape. In Guinea Forestière ecological data is focussed on a small number of classified forests and there is limited biodiversity data available outside of classified forests and protected areas (see for example, Figure 12). Freeman et al., (2019) used modelled habitat suitability for the Zياما to Gola forest complex to identify potentially suitable corridors for western chimpanzees, pygmy hippos and forest elephants (Figure 13). Such analyses can provide a useful starting point for investigating and verifying suitable corridors, a process that needs to build on broad expert input, government, and stakeholder engagement and on ground data and surveys. The recent movements of forest elephants (Figure 11) emphasise the importance of understanding ecological requirements of species, the wider landscape context, and the various factors (socio-economic, cultural, ecological etc.) that may influence the movements of individual species as well as the feasibility of maintaining or improving connectivity.

¹¹ Mount Nimba (Guinea) IUCN Ia; Tingi Hills (Sierra Leone) IUCN II; Gola Rainforest National Park (Liberia/Sierra Leone) IUCN II; Loma Mountains (Sierra Leone) IUCN II.

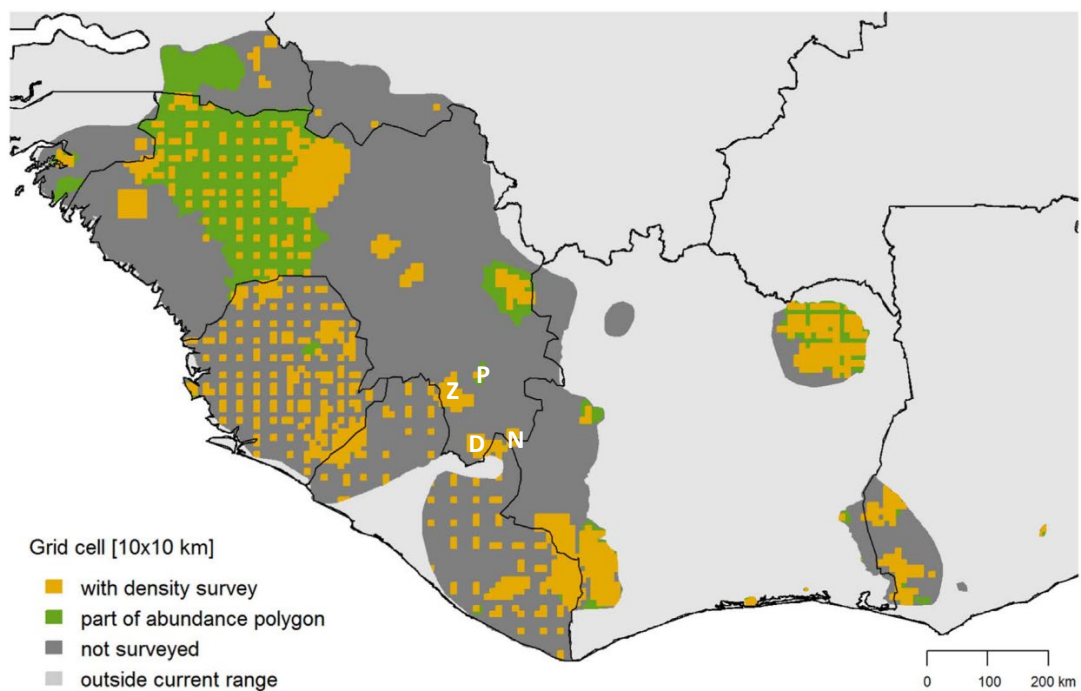


Figure 12 Map showing unsurveyed areas in the landscape (grey) from Heinicke et al. (2019a). In the Guinea Forestière area of the Transboundary Landscape survey data is concentrated in the larger classified forests of Diecke (D) and Pic du Fon (P), and protected areas of Ziama (Z) and Nimba (N).

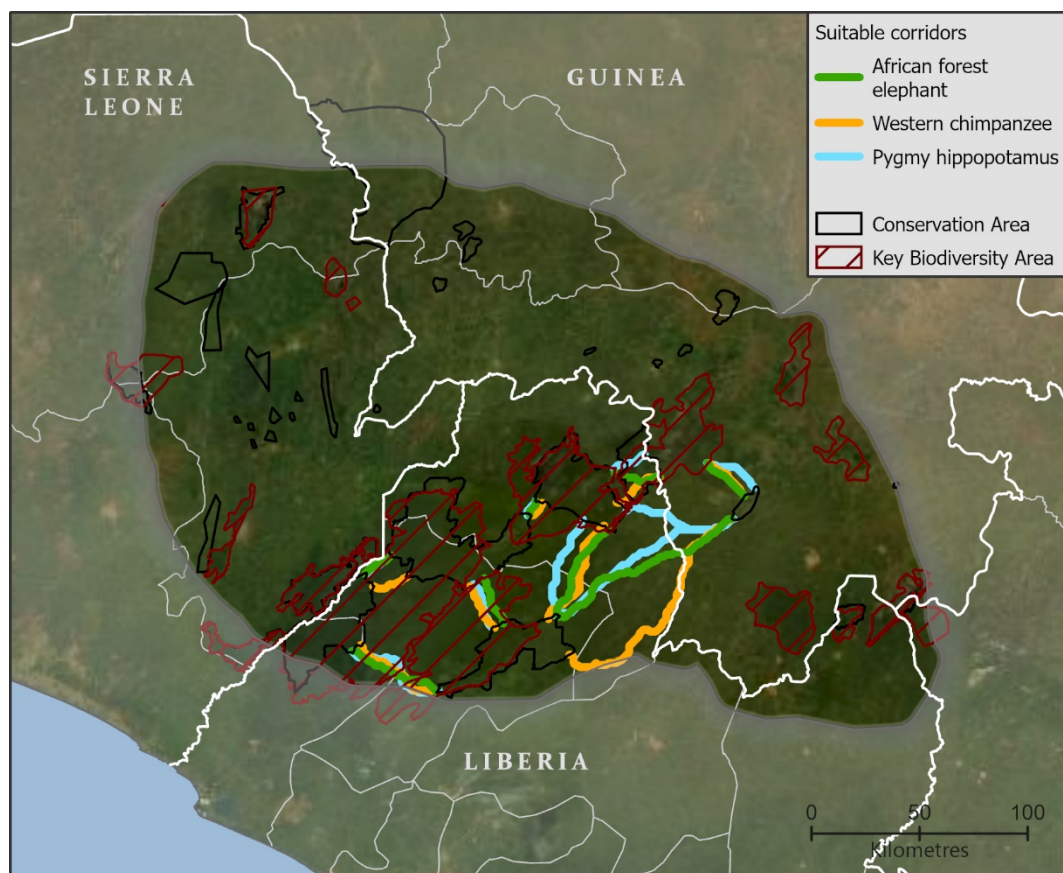


Figure 13 Potentially suitable corridors for western chimpanzees, pygmy hippos and forest elephants based on modelled habitat suitability (Freeman et al., 2019).

Securing protection for known conservation priorities and maintaining and improving functional connectivity within and between extant forest patches will therefore be important across the landscape, both within jurisdictions (e.g. between the classified forests and protected areas of Guinea Forestière) and across borders (e.g. the Ziama-Wonegizi-Wologizi-Foya forest complex across the Guinea-Liberia border).

Identified areas of high conservation value can help to determine where in the landscape impacts need to be avoided and minimised and where to target conservation activities to maximise outcomes for biodiversity, carbon and other ecosystem service values, with the importance of transboundary conservation efforts emphasised. For example, it can help in the designation of no-go zones for impacts and particular industries, inform the gazettelement of new protected areas or the upgrading of current protections, the prioritisation of areas for sustainable climate financing (e.g. through REDD+) and/or industry investment (e.g. through biodiversity offsets), and it can inform mitigation planning at the operation or project level (see Section 4). It can further direct future research and survey efforts to address information gaps and help identify threats and opportunities outside of protected areas where participatory prioritisation and delivery of conservation activities needs to be focussed. This is likely to be particularly important for the conservation of western chimpanzees and forest elephants.

2.4 A landscape under intensifying development pressure



STEP 2

Assessing and understanding landscape: threats and pressures today and in future

STEP 1 | **STEP 2** | STEP 3 | STEP 4

The biodiverse Transboundary Landscape supports plantation and smallholder agriculture, commercial and community forestry, artisanal and large-scale mining, hydropower, and linear infrastructure projects. It is a landscape expected to face rapid, transformation change, with numerous planned developments expected to move forward, some coinciding with areas of very high biodiversity value. The section below summarises the current status of existing and planned development projects in the major sectors in the landscape, the proximity of development projects to identified conservation priorities, as well as other threats and pressures.

Agriculture

An estimated 59% of Guinean land in this transboundary landscape is under agricultural production, while 55% is under production in the Eastern province of Sierra Leone, and only 28% in the Liberian transboundary area¹². This is reflected in the comparatively high level of Upper Guinean forest cover remaining in Liberia.

Water supply in the landscape is generally not limiting for production, as almost all agriculture in the Transboundary region is rain-fed. Rice is by far the most significant crop in this landscape, and it is grown on 80-90% of all cereal cropped area in the landscape, being virtually the only cereal grown in Liberia (Gunjal &

¹² Data sourced from the Food and Agriculture Organization of the United Nations' FAOSTAT: <http://www.fao.org/faostat/en/#data/RL/visualize>

Senahoun, 2016). Other common staple crops include cassava and hot peppers. On the Liberia side, the north central region, which includes Lofa, Nimba and Bong counties (parts of which are included in the focal landscape) has been the traditional food belt of the country producing over half the supply of staple crops such as rice and cassava. In the Transboundary areas of Guinea and Sierra Leone both Guinea Forestière and the Eastern Province are the rice-producing regions of their respective countries. All three countries count rice as their main staple food and are within the top 20 rice-consuming nations of the world; none produce enough rice domestically to meet demand.

All three countries grow cash crops, particularly cacao, oil palm, coffee and rubber, which make up the bulk of agricultural exports from both the landscape and the three countries as a whole and provide significant sources of income for smallholders. Primary agricultural exports from these countries differ, with rubber being a primary export in Liberia and cocoa a primary export in Sierra Leone. Guinea produces a significant amount of palm oil and rubber in the Guinea Forestière region, though export quantities of these commodities remain relatively low (World Bank Group, 2020). Coffee is grown by all three countries in the Transboundary Landscape but growth potential is limited as the lower-value *Coffea robusta* is the coffee variety best-suited to the low altitude Transboundary Landscape. Opportunities for cross-border trade are highlighted in Liberia's National Development Plan and underpin the business strategy for some agricultural development projects planned in Guinea Forestière.

Sierra Leone: Since 2007, the government of Sierra Leone has granted 12% of the country's arable land to foreign agribusiness investment (Cavanagh, 2018), including the cocoa and coffee sectors. Sierra Leone had a thriving cocoa sector prior to the civil war, but lack of maintenance has rendered many plantations unproductive and difficult to rehabilitate, and a lack of investment has slowed reestablishment of new plantations (Denis et al., 2015). Investment from NGOs and multilateral organisations into this sector is increasing, however, (Devries, 2016), and in the past decade, cocoa exports as a percentage of total exports from Sierra Leone have risen from 10% to 22% (Trading Economics, 2020).

Liberia: Currently, rubber and palm oil are the highest agriculture export commodities by value in Liberia with a target set to double the acreage of oil palm cultivation nationally using out grower communities (Government of the Republic of Liberia, 2018). Agricultural concessions (oil palm) are situated adjacent to the southern border of the Kpo Proposed Protected Area between Ganta and Saclepea and south-west towards Gola National Park, extending beyond the Transboundary Landscape area (see Figure 14). There are plans to expand the area under plantation along the Ganta-Saclepea highway, including development of a reported 80 miles of internal plantation roads (Government of the Republic of Liberia, 2018; Sonpon, 2019). Cocoa is projected to become the second highest agriculture export commodity by value, after rubber (Government of the Republic of Liberia, 2018) with the northwest of the country being targeted for reestablishment and growth of Liberia's cacao sector, building on successes in Sierra Leone with re-establishment of the cacao sector post-war.

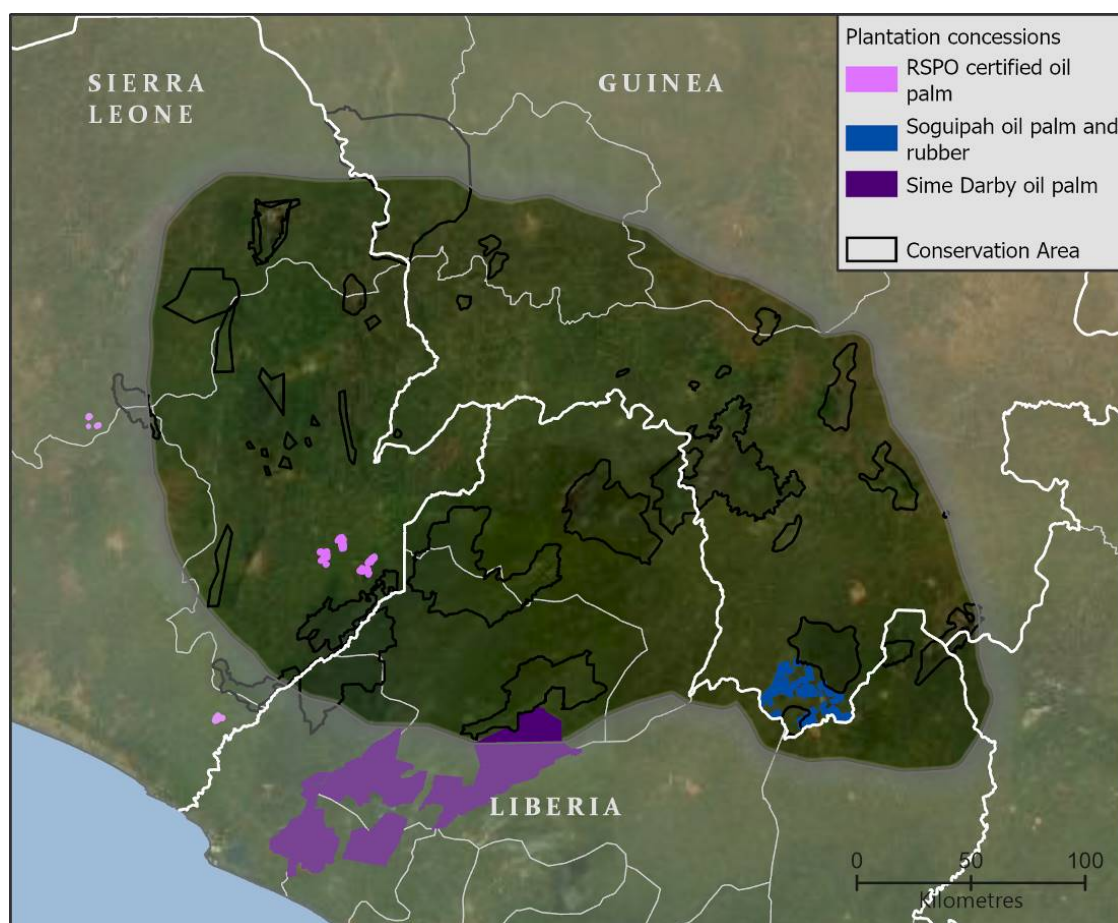


Figure 14 Location of plantation concessions (based on available data) and conservation areas in the Transboundary Landscape

Guinea: The national agricultural policy has, since 1986, emphasised the development of large export-oriented rubber and oil palm plantations from the Guinea Forestière region where they are produced both in large plantations and by smallholders. Currently the Guinean oil palm and rubber company, Société Guinéenne de Palmiers à Huile et d'Hévéa (Soguipah), is the largest rubber and palm oil producer in the country (Box 3 and Figure 14). Soguipah purchases palm fruit bunches and raw natural rubber from about 3,000 smallholders in the area, as well as running their own oil palm and rubber plantations of a combined 10,000 ha (Balde et al., 2019). Soguipah's plantations are situated adjacent to Diécké classified forest – the largest surviving near-pristine lowland evergreen forest in the Guinea Forestière region and a Key Biodiversity Area. There is also a renewed interest in coffee and cocoa production in Guinea's Yomou area, but production remains low compared to oil palm and rubber production (Balde et al., 2019).

More recent to enter the landscape is the for-profit venture, ImpactAgri, which brings together major companies, investors and stakeholders to establish agricultural enterprises with secure market access that are socially inclusive with active participation of local farmers and communities. Whilst ventures in the landscape are in their infancy, the company seeks to promote agroforestry-based farming systems and sustainable intensification models to reduce the footprint, land restoration or regeneration, and adding value to existing crops grown in the landscape context (see also Box 9 in Section 4.4).

BOX 3: PALM OIL AND RUBBER PRODUCTION IN GUINEA FORESTIÈRE

Soguipah was founded in 1987 by the Guinean government with the mandate of undertaking the large-scale production of palm oil and rubber in Yomou prefecture in the districts of Diecke and Bignamou and promoting it to local smallholders. Plantations were first established in 1989.

Soguipah's land holdings extend across 22,830 ha with rubber and oil palm plantations covering 15,993 ha (70%) of the area. Unplanted areas are estimated to cover 6,582 ha with potential for future expansion though this also encompasses sites with various environmental protections (hills, lowlands, springs, classified areas etc). The remaining land is partially devoted to tracks and infrastructure. Soguipah has its own factory for processing rubber, a palm oil mill (established in 1996) and soap and curd (coagulated rubber) processing plants. Soguipah has also developed land for lowland irrigated rice production.

Smallholder production of oil palm and rubber (alongside rice and other crops) has been promoted to boost rural development with the company providing extension service support to local producers. Today an estimated 3,000 farmers from 25 groups sell to the company, with each farm around 2 ha in size. Clear land tenure, favourable agro-ecological conditions and accessibility (prioritising plots alongside existing feeder roads) are key criteria for the selection of areas for smallholder schemes.

Soguipah developed a plan to expand oil palm and rubber production in 2005, including identification and mapping of sites suitable for cultivation within the prefecture of Guéckédou and Yomou in Guinea Forestière, and in the Kolenthen zone in the Lower Guinea region. The use of degraded lands to support expansion, particularly for rubber, are considered subject to other factors being suitable for cultivation.

In the past, the forest wetlands (bas-fonds) were converted for cultivation, a practice encouraged through subsidies and supported by development agencies until recently. Where forest is cleared for cultivation Soguipah is required to reforest. Impacts on these reforested areas and protected forests are managed by Soguipah.

Sources: Interviews with Soguipah representatives, 2020; Balde et al., 2019; Soguipah, 2019

Forestry

Timber extraction has reduced considerably in the Mano River countries over the past decade (IUCN, 2017; Forest Trends, 2020). For Liberia, recognition of the contribution timber extraction made to the ability of warring factions to fund their activities led to a UN sanction on timber exports that lasted until 2006, while Sierra Leone suspended all timber concessions and banned timber exports in 2008 due to accusations of illegal activity (BBC, 2008). Today, forestry remains an active industry in parts of the Transboundary Landscape. In Guinea Forestière, the sole logging company, Forêt Forte, was founded in 2002 and signed an agreement with the Guinean government granting them exclusive concessionary rights to 800,000 ha within Guinee Forestiere, including both Diecke and Ziama (Blackett & Gardette, 2008; US Embassy Conakry, 2008). While these access agreements remain valid for 25 years, Forêt Forte is not currently active within Diecke or Ziama. For Liberia only, forestry concessions are represented in Figure 15. This includes large commercial forestry concessions, as well as several community forests for commercial and/or conservation purposes.

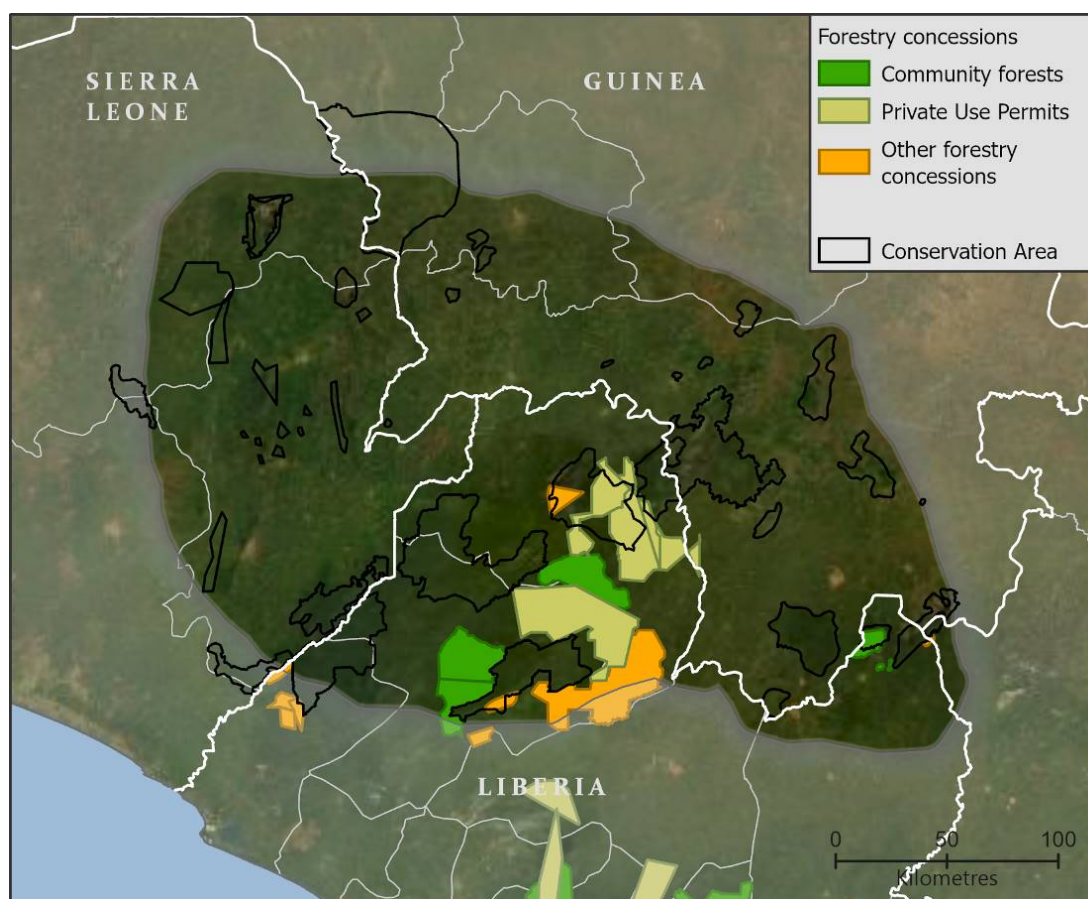


Figure 15 Forestry concessions in relation to conservation areas - Liberia only.

Mining, energy and infrastructure

Large-scale mining and artisanal and small-scale mining (ASM) are prominent across the landscape and in all three countries, with the area recognised for having significant potential for mineral exploitation. Mining claims have been granted across large areas of the landscape (see Figure 16).

Large-scale mining interests in the landscape, particularly on the Guinea-Liberia border, focus predominately on iron ore, as well as graphite (e.g. north and west of Nimba) and nickel (e.g. east of Nimba). Iron ore is also mined in the Sierra Leone part of the landscape (e.g. at the Tonkolili mine project). Mineral concessions and permits for exploration and exploitation are also for gold and other base metals, and for diamonds. In the Sierra Leone extent of the landscape, mining is dominated by diamonds, which make up 63% of Sierra Leone's total exports by value (Trading Economics, 2020). Commercial diamond extraction is centred near Koidu Town (Sefadu), at the mines of Koidu Limited, which took control of the formerly state-owned mining operation near the end of Sierra Leone's civil war (Transparency International, 2019).

There are no official production numbers for ASM in Guinea, however an estimated 25 million carats of diamonds are reported to be located in an area known as the "diamond triangle" (Kérouané, Kissidouyou, Macenta) (ECA & African Minerals Development Centre, n.d.). Part of the triangle is situated within Guinea Forestière with an extensive artisanal diamond mining zone located north of Macenta, adjacent to and extending north and east of the Milo Classified Forest. The artisanal diamond sector is largely governed by customary practices and, whilst there was historically large-scale mining of diamonds, today diamonds are exclusively produced by artisanal miners (ECA & African Minerals Development Centre, n.d.). An increase in

artisanal mining activity has also been observed around Simandou during periods of inactivity by large-scale mining operations. There is currently no licensing for artisanal mining.

In Liberia and Sierra Leone, there are long-standing gold and alluvial diamond ASM activities including from the Gola-Foya corridor all the way up to Koidu Town. These remain extensive and a main source of direct and/or indirect income for many households (World Bank, 2019b). ASM in the Gola-Foya area of Liberia employs manual extraction techniques using basic tools such as shovels and pickaxes as well as labour-intensive, gravity-based processing methods. The act establishing the Gola Rainforest National Park was passed in December 2016 and demarcation, whilst essential for achieving biodiversity conservation objectives, has sparked conflict with local people, many of whom are dependent on mining. Outside the National Park ASM is allowed and licensed artisanal mines exist. However, many mines remain informal. Despite governmental efforts to formalise the sector, severe legal and procedural barriers prevent miners from formalising (see World Bank (2019b) for more details).

Large-scale mining concessions vary in size in the landscape from 550 ha to over 50,000 ha. More extensive areas are marked for exploration according to the national mining cadastres, including a 75,887 ha exploration area for gold in western Liberia and a vast mineral exploration area extending over 1.96 million ha in Guinea Forestière. Today, mining projects are at varying stages from exploration through to production.

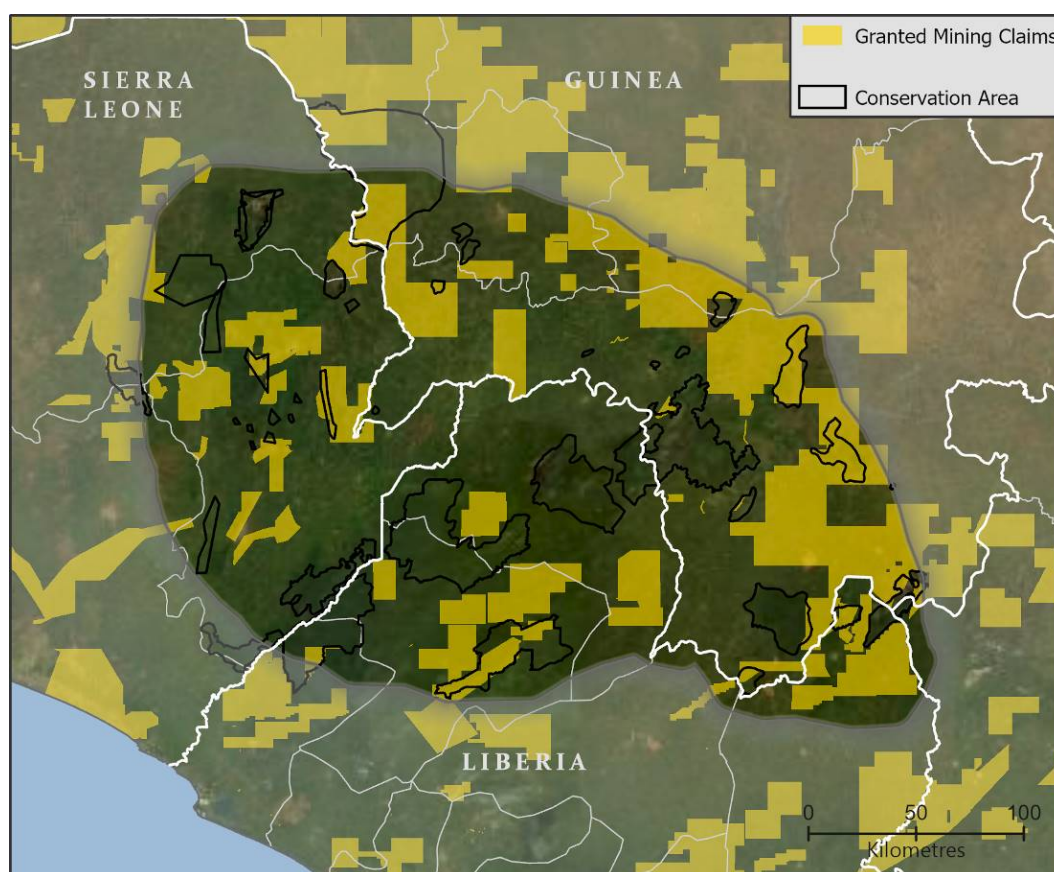


Figure 16 Mining claims in relation to conservation areas across the Transboundary Landscape

Mineral reserves and associated mining claims coincide with areas of high biodiversity and carbon value (Figure 16), including areas important for threatened and endemic species and rare sub-montane and montane forest habitat (e.g. the Pic du Fon classified forest in the Simandou Hills in Guinea, and Mount Nimba in Guinea/Liberia).

Several mining exploration areas and concessions overlap or are situated immediately adjacent to recognised conservation areas. For example, exploration areas for gold and base metals overlap almost the entire extent of the Kpo mountains and Proposed Protected Area in Liberia according to the [National Concession Portal](#). Whilst around the Nimba mountains in Guinea and Liberia, there are numerous exploration licenses as well as mines in advanced planning stages (see Box 4) or in production, such as ArcelorMittal's Nimba iron ore mining project. According to a recent report, an exploration permit for iron ore was issued in 2019 extending across 152 ha of the Blei community forest (situated south-west of East Nimba), without the consent of the Blei community board, and a further 70 ha of another nearby community forest (Mukpo & Giahvue, 2020).

In Guinea, sustained instability, political risks, and lack of transport infrastructure have limited exploitation of mineral wealth historically but this is changing rapidly with the significance of the mining sector's contribution to Guinea's national economy having increased dramatically in recent years. This is reflected in the International Council on Mining and Metals (ICMM) Mining Contribution Index report 2018 in which Guinea ranked third (up 28 places compared to 2016). It underscores the country's dependence on mining, its role as a catalyst in the structural transformation of the economy (e.g. through investments in energy, roads, ports and airports etc.) and its significance in Guinea's economic life.

Development of the mining sector in Guinea Forestière (notably around the mountainous areas of Nimba and Simandou) has been slow to date, with several iron-ore mining projects in the Simandou Hills and around Mount Nimba planned but not yet in construction. However, these projects are currently scheduled to advance mine development and associated transport infrastructure (roads, rail, ports) within the next five years (subject to the necessary approvals). Progress in this timeframe appears to be increasingly likely given several recent developments, including the resolution of protracted legal disputes linked to Rio Tinto's Simandou mine, the recent entry of Winning Consortium Simandou into the landscape, as well as signed agreements to enable the transport and export of ore (see Box 4).

The logistics of exporting tonnes of raw material has been a major hurdle for prospective developers of Guinea Forestière's mineral resources. However, extensive linear transport infrastructure developments and improvements are planned within and beyond Guinea Forestière, which will improve access to and from the region and induce growth in other sectors.

This includes the construction of a 650-kilometre railway to the coast and a deep water port as a requirement for the developers of the large Simandou iron ore deposit, a project that catalysed the Southern Guinea Growth Corridor initiative to promote economic growth (Figure 17). The railway is expected to provide access to a fertile but unexploited agricultural region, the sea port adding to shipping capacity and supporting growth in international trade, investment in power generation, and development of new and upgraded road network (Intergovernmental Forum on Mining Minerals Metals and Sustainable Development (IGF), 2018). The railway is expected to directly intersect with areas of high conservation and ecosystem service value across southern Guinea (e.g. Kormos et al., 2014).

Export of mined material from the Nimba area is also planned via Liberia from the port at Buchanan and in October 2019, Guinea and Liberia signed a deal to allow several mines in Guinea, including Nimba iron ore project and Sama Resources Guinea (SRG) Mining's graphite project, to export through Liberia (Reuters, 2019). The authorisation applies to the first 5 million tonnes produced at the mines. Agreement must also be reached with ArcelorMittal, sole rail concession holder.

Unlike the southern corridor initiative, the rail link through Liberia requires only upgrading and minimal extension. The World Bank estimated that the cost savings of going through Liberia would be roughly USD 1 billion over a 20-year period (or USD 3.49 per tonne via Conakry in Guinea versus USD 1.22 per tonne via Buchanan in Liberia) when the full lifecycle costs of running the two alternative railroads are considered, (Intergovernmental Forum on Mining Minerals Metals and Sustainable Development (IGF), 2018).

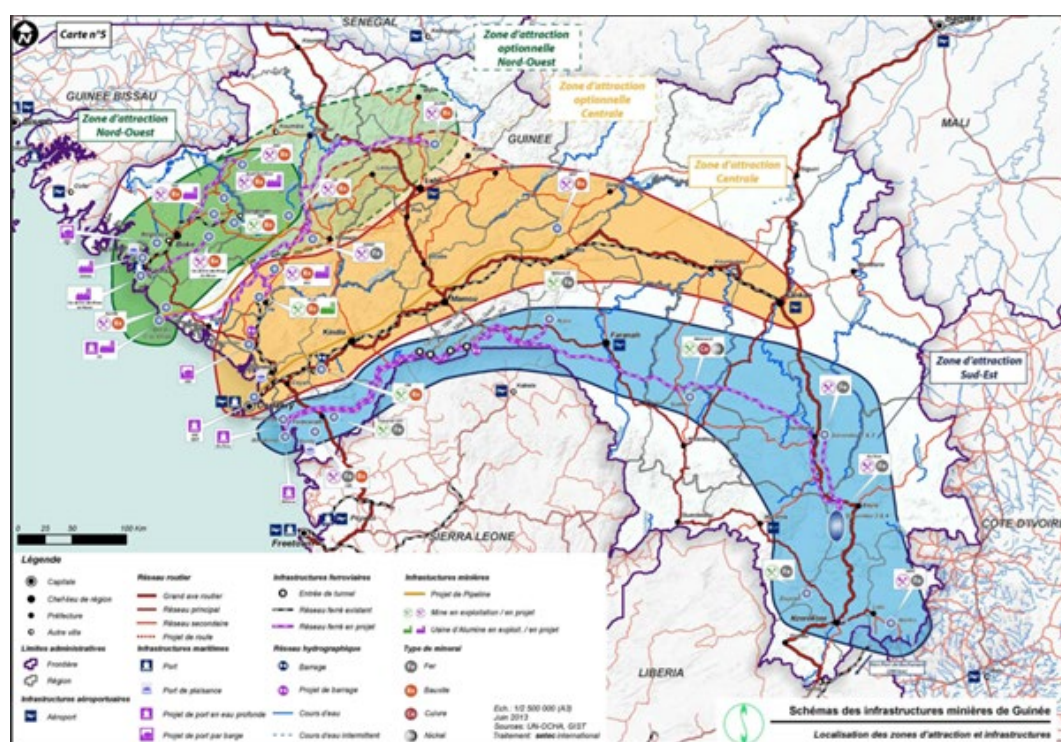


Figure 17 Proposed development corridors in Guinea including the southern growth corridor (blue) designed to promote economic growth through development of multiple sectors, catalysed by new mine projects and associated transport infrastructure. The Southern Guinea corridor is shown in blue. Source: <https://mines.gov.gn/en/priorities/infrastructure/>

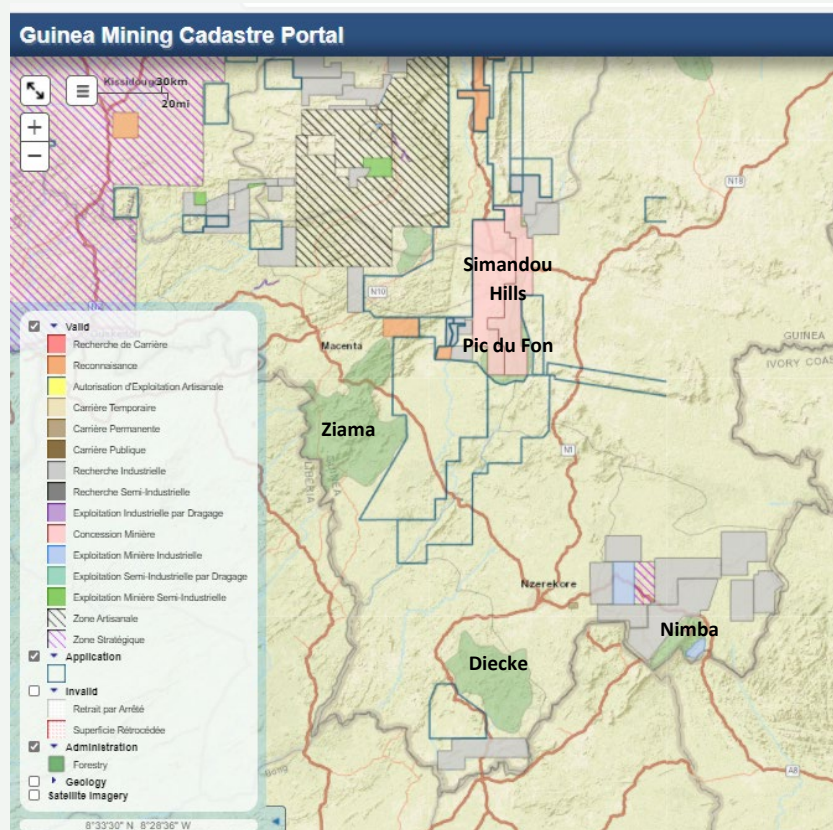
BOX 4: MINING INTERESTS IN GUINEA FORESTIÈRE

Simandou

Located in the Simandou mountain range of south-east Guinea, Simandou holds over 2 billion tonnes of iron ore reserves, including some of the highest grade, low-cost reserves in the industry (Jamasmie, 2019). Simandou would by itself be the world’s fifth-largest producer. In 1997, the Government of Guinea divided the Simandou Mountains into four exploration blocks. Tenure under the Simandou Mining Concession (blocks 3 and 4 on the eastern side) is held by Simfer SA, which is owned jointly by Rio Tinto (45.05%), Chinalco (39.95%) and the Republic of Guinea (15%). The exploitation of this mineral reserve has, to date, been hampered by protracted legal disputes. However, the situation is changing with legal issues brought to a close in early 2019 and Chinese funding is reportedly increasingly likely¹³, removing two major obstacles for the eastern Simandou project to move forward.

¹³ According to recent media report (Biesheuvel et al., 2020), China’s State-owned Assets Supervision and Administration Commission (SASAC) which oversees the biggest government-owned enterprises, is actively pushing the project.

Guinea has also required that Simandou's output must be shipped via the country's own port thus requiring a 650 km trans-Guinean railway line and port to be constructed. The high costs involved have been a roadblock for developers (Biesheuvel et al., 2020). However, in November 2019, a Guinean-led consortium with Chinese, French and Singaporean interests won a USD 14 billion tender to develop the western Blocks 1 and 2 and the required infrastructure to export the ore from Guinea. The consortium which includes Singapore's Winning Shipping, Guinean mining logistics firm United Mining Supply (UMS), Chinese aluminium producer Shandong Weiqiao, and the Government of Guinea (Reid & Tanisha, 2020) with a 10% stake. Société Minière de Boké (SMB), a company founded in 2014 and controlled by the consortium, has rapidly become the biggest bauxite exporter in Guinea. The consortium is developing Simandou through a new company, Winning Consortium Simandou.



Current exploration and mine concession areas in the south-eastern corner of Guinea Forestière, and their proximity to known sites of conservation importance including the Ziamia MAB, Pic du Fon Classified Forest in the Simandou Hills, Diecke Classified Forest and Mount Nimba Nature Reserve and World Heritage Site. Source: [Guinea Mining Cadastre Portal](#)

The first phase of the proposed project focuses on mine, rail and port development, with plans for production, costing an estimated \$8 billion (USD 5 billion alone for the 650 km railway from the mountainous forest region to the coast and requires multiple bridges, sidings and more than 25km of tunnels), and producing 60 million tonnes a year from 2026. The second phase proposes to double capacity of the railway to 200 million tonnes and open new ore bodies and expand a deepwater port at Matakong. It is anticipated that Blocks 1 and 2 would then be producing 110 million tonnes annually (Hume, 2019). In June 2020, the consortium are a step closer to realising this project as the Government of Guinea signed a basic agreement for the development of blocks 1 and 2 (Reuters, 2020). The deal includes the construction of the railway to the coast and the deep-sea water port. Latest media reports also confirm the intended timeline to move into production within five years (Reid & Tanisha, 2020). Development of the mines and associated infrastructure are expected to advance at pace once restrictions relating to the global pandemic are lifted.

In 2019, Niron Metals Plc. (Niron) was also granted permission to develop the nearby, smaller Zogota iron ore deposit. Whilst the current status of the Zagota mining project is unclear, according to reports a Memorandum of Understanding was signed between the Government of the Republic of Liberia and Niron to export iron ore through Liberia (APO Group, 2019).

Nimba

The proposed Nimba Iron Ore Mine (a high-grade open pit iron ore mine) is located in the Guinean Nimba Mountains Strict Nature Reserve and World Heritage Site. The boundary of the Reserve and WHS was modified in 1993 to exclude a keyhole-shaped area to allow mining – ‘the mining enclave’ – and the proposed project concession area is located within this enclave. The mineral reserve is estimated to comprise around a billion tonnes of high-grade iron ore containing very low levels of impurities.

Exploration has been ongoing since the 1960s and by Société des Mines de Fer de Guinée (SMFG) since 2005. The most recent drilling campaign ended in 2013 and the site entered a care and maintenance phase. In September 2019, High Power Exploration (HPX) acquired the 85% interest in the Nimba iron ore deposit in Guinea (High Power Exploration, 2019). SMFG continues as the Guinean company operating the project. Work to complete technical development studies and an Environmental and Social Impact Assessment (ESIA) restarted in late 2019 and will continue through 2022 to develop a mine producing 15-30 million tonnes per annum (Mtpa), exported via Liberia, with construction planned to start in 2023.

Sama Resources Guinea (SRG) Mining Inc., a Canadian company, is developing the Lola graphite deposit situated to the east of Lola town. Exploration linked to the Gogota cobalt-nickel-scandium rich laterite deposit near the town of Lola is also ongoing by the company (SRG Mining Inc, n.d.). On the Liberian side, ArcelorMittal’s Nimba iron ore mining project is already in production and additional exploration licenses have been issued to the south of Nimba.

Around Nimba, concessions and exploration permits have been issued for iron ore, graphite and nickel. New mining operators continue to enter the landscape both on the Guinea and Liberia sides of Nimba and exploration permits have been issued that overlap with important community forests including that of Blei (Mukpo & Giahvue, 2020).

2.5 Unregulated land uses, other threats and pressures

Ongoing sectoral projects and planned development of regulated industry activities is occurring in the context of a rapidly growing human population, expansive road network and an increasing human footprint in the Transboundary Landscape (Figure 18). In addition to industrial development, major threats to biodiversity in the landscape include agricultural expansion to provide for the needs of a rapidly growing population in rural and urban areas, unsustainable logging and fishing, hunting and trade of bushmeat, expansion and establishment of settlements (e.g. the towns of Zorzor and Voinjama in Lofa county) and pollution, among others. These threats are often linked, either directly or indirectly, to a high incidence of poverty, political instability and/or civil conflict (IUCN & UNEP-WCMC, 2015). Road development and enhancement programmes are also underway or planned, connecting settlements and improving access. In and around the Zياما MAB, these roads have been identified as an important driver of deforestation risk (FFI, 2020a).

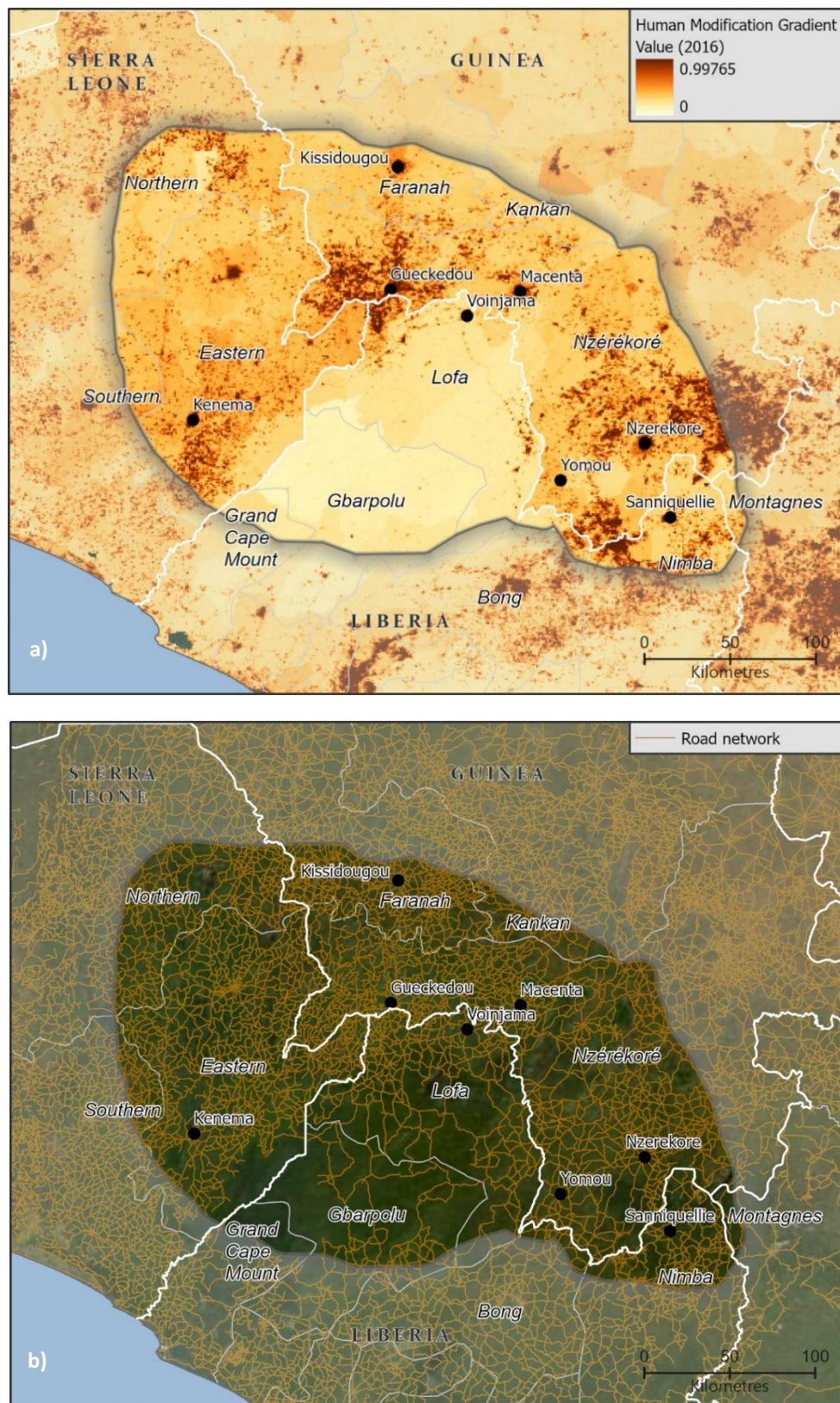


Figure 18 (a) The Human Modification Gradient (2016) represents the level of human influence on biomes (a higher value and dark colours indicate high influence; lower score and light colours represent low influence). The Human Modification Gradient value is a cumulative measure of the level of human modification based on modelling the physical extents of 13 anthropogenic stressors and their estimated impacts across the global terrestrial extent using spatially explicit global datasets for the year 2016. (b) Transboundary Landscape road network as an indicator of human use of the landscape.

Small-scale agriculture, an unregulated land use activity, has been increasing in the past two decades linked to high rates of population growth as well as the targeted promotion of smallholder production of both staple cereals and commodities such as palm oil, rubber, cocoa and rice (Figure 19). Rice cultivation, especially paddy or wetland rice cultivation, is a threat to biodiversity in the area. The forest wetlands (bas-fonds) in Guinea Forestière were promoted as land for rice and vegetable cultivation by both government and international agencies as recently as the early 2000's (Rangé, 2017), which contributed to increased deforestation, as well as reductions in local amphibian populations due to herbicide poisoning (K. Toupou pers. comm 2020).

This is slowly changing, as cultivating rice in classified forest wetlands is now discouraged, and in some cases illegal. However, customary land tenure systems (where land is passed down according to tribal customs, which differ by village but often include significant inheritances for eldest males), mixed with waves of immigration to and emigration from the area, has led to land divisions that leave some residents functionally landless (Bidou & Toure, 2002). This results in encroachment into forested areas to cultivate, as well as the illegal hunting that is associated with increased forest presence.



Figure 19 A woman prepares oil palm kernels for processing into palm oil in Irié, Guinea. Credit: Elisabeth Villeneuve / FFI

It is estimated that the farming population living in this landscape is about 3.4 million with each farmer working an average of 1.65 ha of land¹⁴. With an average annual population growth rate of 2.6% for the region (World Bank, 2019c) and with current isolation from the capital cities keeping urban migration rates relatively low (Lagakos, 2020), a farming population in the region of 3.98 million can be projected in the Transboundary Landscape by 2030¹⁵. The consequences for average farm size and agricultural expansion are likely to be significant, with implications for rural livelihoods, food security, health and for biodiversity. For example, if smallholder conversion of land to agriculture (mainly by deforestation) does not increase, the average land holding per farmer could be around 1.28 ha, representing a 22% reduction in the landholding per farmer. In

¹⁴ For the purposes of establishing demographic data for this landscape, data are included from the Eastern province of Sierra Leone; from Lofa, Gparpolu and Nimba counties in Liberia; and in Guinea the prefectures of Macenta, N'Zérékoré, Yomou, Guéckédou and Kissidougou.

¹⁵ FFI analysis based on data sourced from World Bank Open Data (<https://data.worldbank.org/>), including most recent datasets on population, population annual growth rate, and % agricultural land for each relevant country and, where possible, sub-region.

reality, the expansion of agricultural land at the expense of natural habitat (forest and non-forest) is anticipated and may contribute to increased food insecurity, reduced social cohesion and increased conflict as well as the degradation and loss of habitat with implications for species and ecosystem function.

A number of factors influence individual decisions relating to where to farm. In the Transboundary Landscape this is likely to include considerations such as:

- Proximity to home
- Proximity to water (irrigation potential)
- Proximity to road
- Prevalence of crop-raiding / risk of human-wildlife conflict
- Access to casual labour
- Size and slope of land, and whether it requires clearing
- Soil type, quality and fertility
- Tree cover (general / shade)
- Extension service support (e.g. NGO / project presence)
- Localised yield and pest reports.

Understanding the factors that influence individual land use decisions can help determine where in the landscape might be more vulnerable to conversion, including areas that are close to existing settlements, roads and water sources.

Although Guinée Forestière is far removed from the capital city of Conakry, with the drive from N'Zérékoré to Conakry taking about 18 hours along one road (570 km), urban-rural links in Guinée Forestière remain strong. Urban families elsewhere in Guinea will often send cash support to forest families during the hunger season (roughly August to November), which is then repaid with food remittances sent to urban families post-harvest (Action Against Hunger, 2012). There is also some physical internal migration related to agricultural seasons, with urban populations returning to rural agricultural areas to help during planting and harvest, and urban homes hosting rural family members when less attention is required on-farm (Maastricht Graduate School of Governance, 2017). While internal migration related to mining development can be observed in the region, it has not yet reached a point where it is considered a significant driver of change, though that is expected to change in coming years with continued mining expansion in the region.

The effects of climate change, manifesting in the form of changes to weather patterns and temperature and extreme climate events (such as more frequent and/or severe droughts, excessive rains and floods) are already impacting parts of the wider Upper Guinean Forest region with implications for human health, livelihoods, productivity and food security, access to shelter, security and ecosystem degradation. According to the Climate Change Vulnerability Index 2017, the majority of West Africa is considered high to extreme risk with the Liberia among the top five countries in terms of climate risk (Verisk Maplecroft, 2017).

Due to a combination of naturally high levels of climate variability, high reliance on rain-fed agriculture and limited economic and institutional capacity to cope with and adapt to climate variability and change, the region's agriculture sector is particularly vulnerable to current and future climate change effects - affecting the arability of land, crop productivity and livestock rearing, adding pressure on natural resources and shifting the distribution of what can be produced where (Sultan & Gaetani, 2016; FAO, 2018; Oxford Business Group, 2019). For example, changes in rainfall distribution, pattern and intensity have severe consequences for smallholder farmers (IPBES, 2018).

In combination these pressures are anticipated to drive ongoing habitat clearance, biodiversity loss and land degradation, threatening remnant forest habitat and connectivity and compromising the long-term sustainability and resilience of the landscape for biodiversity and for local communities.

3 IMPLICATIONS OF UNMITIGATED DEVELOPMENT



STEP 3

Impact assessment and mitigation planning

STEP 1 | STEP 2 | **STEP 3** | STEP 4

3.1 Unmitigated multi-sectoral impacts

Available data provides an indication of the wide-ranging impacts of multi-sectoral development on species, ecosystems, ecosystem services and society (see [report](#) (FFI, 2021b) for a more detailed overview of the implications of multi-sectoral development for socioecological systems). These impacts have to be evaluated in the context and conditions of the landscape, a rapidly growing rural population and the effects of unregulated land uses and activities. Table 3 provides a high level, generalised overview of some of the main types of direct and indirect impacts (pre-mitigation) associated with the different sectors present in the landscape and high-level ecological outcomes (see also Figure 21).

Multi-sectoral development in the landscape has already contributed to the transformation of parts of the landscape leading to habitat loss and fragmentation: the correlation between the intensity of the road network, human habitat modification and remaining extant forest is striking (Figure 20). It also paints a bleak picture for biodiversity with a recent study showing that nearly 40% of western chimpanzees already live within 5 km of a human settlement, nearly 60% are within 5 km of a road and almost 90% are within 10 km of a road (Heinicke, et al., 2019a). As human activities increasingly modify landscapes and remoteness continues to dwindle, there is a pressing need to better identify and anticipate the direct, indirect and cumulative impacts of multi-sectoral development and, crucially, to mitigate, reduce or remove emerging and ongoing threats (IUCN SSC Primate Specialist Group, 2020).

Multi-sectoral development across the Transboundary Landscape is expected to contribute to large-scale habitat loss and fragmentation. This will result both from direct habitat clearance for infrastructure and production (small and large-scale) and indirectly through the induced growth of other sectors (e.g. agriculture), improved access to the region, and in-migration contributing to further growth in the human population, putting increased pressure on land, water and natural resources. The cumulative effects of even small-scale deforestation events can be significant (see Box 5). Ecological consequences of habitat loss, degradation and fragmentation include, for example: reduced local availability of food, security, nesting sites and breeding cover for wildlife; edge effects; barriers to wildlife movement and reduced escape and avoidance options; impacts for ecosystem functions and services; and increased run off and erosion risk.

Habitat clearance, degradation and fragmentation poses one of the greatest threats to species in this landscape. The cumulative effects of both small- and large-scale activities can contribute to the direct loss of individuals and groups and increasing the risk of local population losses and the potential for species extinctions (e.g. in the case of restricted range or endemic species). Smaller and less mobile species, ecological specialists (e.g. those dependent on intact forest habitat to survive), as well as large wide-ranging mammals, such as the western chimpanzee and forest elephant, are among those at particularly high risk.

The sociobiology of species will further affect their response to impacts. For example, as a highly territorial species, chimpanzees cannot shift their home range to move away from disturbances caused by infrastructure development. Where chimpanzees are displaced as a result of development impacts (e.g. habitat loss or degradation, light or noise disturbance, human-wildlife conflict etc.) this can lead to conflict with neighbouring

chimpanzee groups resulting in heightened stress and the direct loss of individuals, groups and communities. For example, under a worst-case scenario the original ESIA for the Simfer SA Simandou project predicted a high degree of chimpanzee mortality when communities are forced together as they lose habitat and move away from mining activities. An estimated 25% of the core of the chimpanzees' range would be permanently and irrecoverably lost to mining (Kormos et al., 2014). Today, plans are afoot to develop all four of the Simandou blocks such that the worst-case scenario could be even more severe.

Increasing habitat fragmentation in this landscape could further adversely impact areas already identified to have low population connectivity for chimpanzees (Heinicke et al., 2019a, 2019b). In the Bossou Hills in Guinea, for example, the Bossou chimpanzee population has been functionally isolated from neighbouring populations in the Nimba Mountain range for several decades as a result of habitat fragmentation and threatening its long-term viability. The loss of individuals and groups of chimpanzees can contribute to a decline in behavioural diversity, with recent a study demonstrating that chimpanzee behavioural diversity is significantly reduce in areas of highest human impact (Kühl et al., 2019). Habitat fragmentation can also create dispersal barriers for a wide range of species (Laurance et al., 2009). It is evident from the extraordinary movement patterns of Guinea's remaining forest elephants that increasing habitat fragmentation coupled with heightened risks from poaching could threaten the future survival of this iconic species.

The introduction of alien and invasive species and heightened risks of disease exposure will further put both species and human communities at risk (e.g. through people transferring disease to threatened species such as chimpanzees, and wildlife transferring disease to people such as in the case of EVD, SARS and Covid-19). Forest fragmentation and increased human forest presence, for example, is correlated with both biodiversity reduction and increased risk of zoonosis (Rulli et al., 2017; Bovendorp et al., 2019). Human-wildlife conflict and the resultant threats related to poaching and wildlife trafficking also increase cumulatively as the landscape fills with multiple development and activities and as movement into and out of the area is facilitated through improved transport infrastructure.

The induced effects of infrastructure development, particularly those projects designed to stimulate economic development more broadly, for biodiversity have been found to be considerably greater in scale and severity than the direct footprint of the infrastructure itself (World Bank, 2019a; Johnson et al., 2020). Evidence further highlights the impact of infrastructure development and associated in-migration on food production systems, and the customary systems of land and natural resource governance, traditional practises and cultural values and norms. For example, in the bauxite region in the north-west of Guinea there is a taboo on the hunting of chimpanzees among local communities. However, the development of multiple mining projects has led to an influx of people from other parts of the country with different cultural preferences, including the hunting and consumption of chimpanzees, adding further pressure to resident chimpanzee populations.

In Guinea Forestière, when planned developments are considered in conjunction with other industry projects across the borders in Liberia and Sierra Leone, the pace at which planned and newly emerging projects are expecting to move into production, rapid human population growth, the expansion of unregulated land uses (particularly small-scale agriculture), and complex transboundary effects of cross-border supply chains, the potential cumulative impacts are stark. Climate change is expected to exacerbate unmitigated impacts of development whilst deforestation and forest degradation will impact carbon sequestration and storage functions. In the absence of strategic and effective mitigation both at project and landscape scales, there is growing concern for the potential adverse induced and cumulative impacts on biodiversity and people in this already fragmented forest landscape.

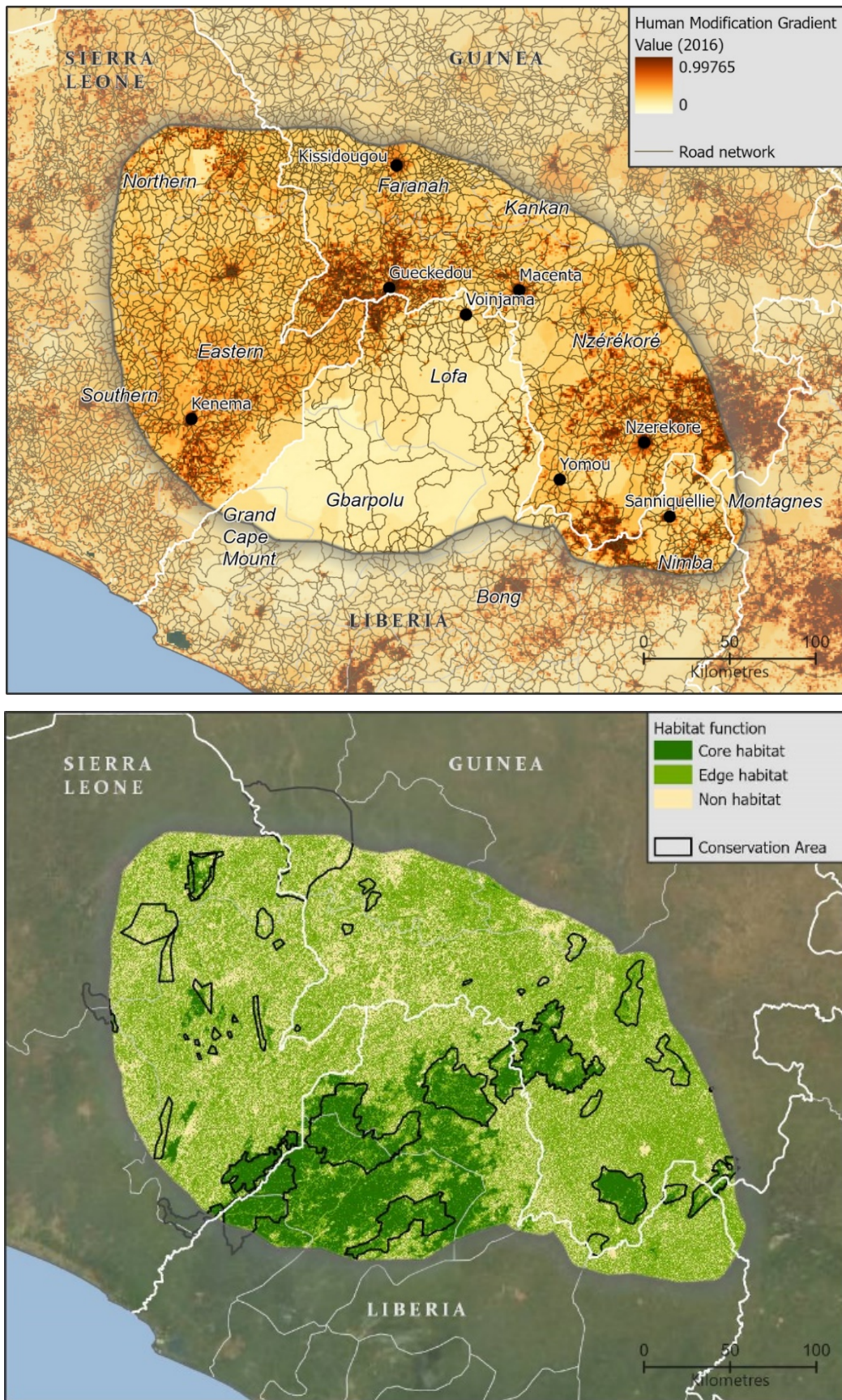


Figure 20 The Human Modification Gradient as of 2016 and road network (top) and forest habitat function (bottom).

Table 3: Overview of potential impacts (• direct, + indirect) that may be associated with different sectors and generalised ecological outcomes by component. The table is intended to be illustrative only. It does not provide an exhaustive list of impacts associated with each sector, ecological component or specific landscape conditions and context.

IMPACT	SECTOR									COMPONENT	OUTCOME
	Industrial plantation	Industrial logging concession	Industrial/intensive agriculture	Smallholder agriculture	Agro-forestry	Infrastructure	Mining	Hydropower			
<i>The impact that affects biodiversity, ecosystem services or society component</i>										<i>The focal biodiversity, ecosystem service or society component affected</i>	<i>Examples of high-level outcome or effect on biodiversity, ecosystem service or society</i>
Habitat clearance	• +	• +	• +	• +	• +	• +	• +	• +	• +	Natural habitat Species	Habitat loss Stress / Injury / Mortality Displacement
Habitat degradation	• +	• +	• +	• +	• +	• +	• +	• +	• +	Water Natural habitat Species	Decrease in quality/quantity Habitat degradation Stress / Injury / Mortality Displacement
Habitat fragmentation resulting from clearance, degradation, edge effects	• +	• +	• +	• +	• +	• +	• +	• +	• +	Water Species Natural habitat	Decrease in quality/quantity Displacement Barrier to movement Habitat fragmentation
Resource depletion	• +	• +	• +	• +	• +	• +	• +	• +	• +	Species Water	Injury / Mortality / Stress Displacement Decrease in water quality
Barrier to movement	•		•	•		•	•	•	•	Species	Displacement Injury / Mortality / Stress
Bushmeat/trade (in non- operation area)	+	+	+	+	+	+	+			Species	Stress / Injury / Mortality
Exposure to disease	• +	• +	• +	• +	• +	+	+	+	+	Species	Stress / Injury / Mortality
Human-wildlife conflict	• +	• +	• +	• +	• +	• +	• +			Species	Stress / Injury / Mortality Displacement
Drowning	•						•	•		Species	Stress / Injury / Mortality
Electrocution						•	•			Species	Stress / Injury / Mortality
Fire damage	• +	• +	• +	• +	• +	+	• +	+	+	Species Natural habitat	Stress / Injury / Mortality Habitat loss and degradation
Road collision from vehicular activity	• +	• +	• +			• +	• +	• +	• +	Species	Stress / Injury / Mortality

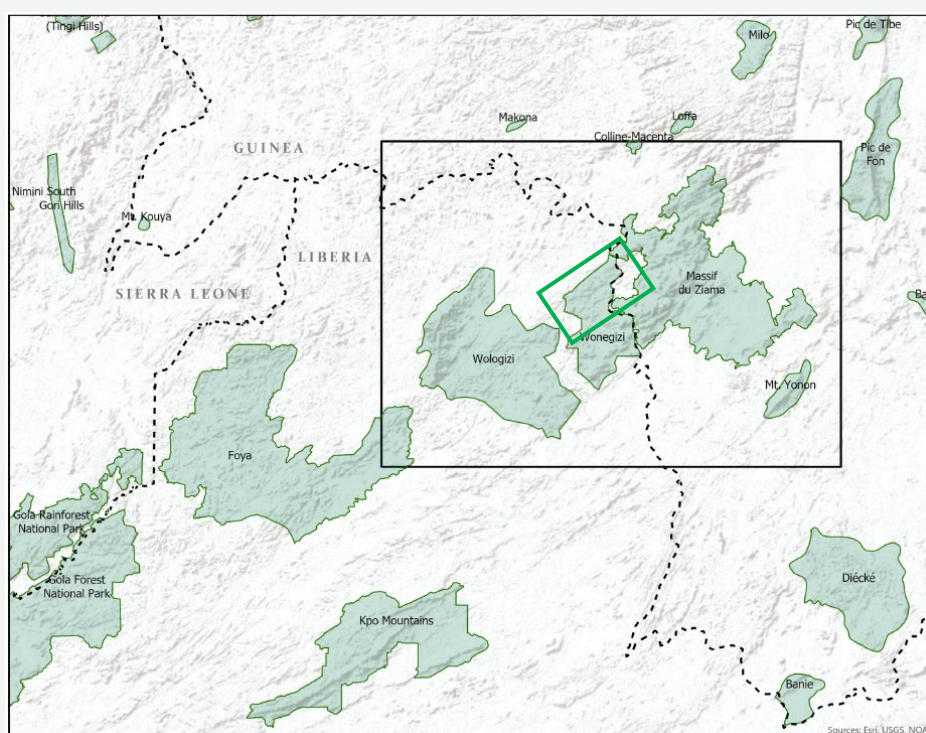
Intra-specific conflict (territorial disputes)	●	●	●	●	●	●+	●+	●	Species	Displacement Stress / Injury / Mortality
Introduction and spread of alien and invasive species	●+	●+	●+	●+	●+	●+	●+	●	Species Natural habitat	Displacement Degradation
Light disturbance	+	+	●+	●+	+	●+	●+		Species	Displacement Barrier to movement
Noise (human) disturbance	●+	●+	●+	●+	●+	●+	●+	●	Species	Displacement Barrier to movement
Noise (machinery) disturbance	●+	●+	●+			●+	●+	●	Species	Displacement Barrier to movement
Alteration of drainage network	●+	●+	●+	●+	●+	●+	●+	●	Water	Decrease in water quantity Altered drainage network
Change to soil properties	●	●	●	●	●				Soil	Decrease in soil quality
Increased nutrient load and/or increased sedimentation	●+	●+	●+	●+	●+	●+	●+	●+	Water	Decrease in water quality
Increased soil erosion	●	●	●	●+	+	●	●	●	Soil Water	Soil instability Decrease in water quality
Pollution (of water resources)	●+		●+	●	●		●+		Species Water Natural habitat	Stress / Injury / Mortality Decrease in water quality Habitat degradation
Pollution (of food resources)			●		●		●		Species	Stress / Injury / Mortality
Pollution (of air e.g. from emissions)	●+	●+	●+	●+	●+	●+	●+	+	Species	Stress / Injury / Mortality Displacement
Pollution from dust	+	+	+	+	+	●+	●+		Natural habitat	Habitat degradation
Chemical pollution	●	●	●	●	●	●	●	●	Species Habitat Soil Water	Stress / Injury / Mortality Degradation Decrease in soil quality Decrease in water quality
Greenhouse gas emissions (from operations)	●	●	●	●			●		Climate regulation	Impact to climate regulation
Reduced carbon sequestration resulting from habitat clearance and degradation	●+	●+	●+	●+	●+	●+	●+	●	Climate regulation	Impact to climate regulation
Reduced resources resulting from clearance of mature plantations	●		●	●	●				Species	Stress / Injury / Mortality
Reduction in soil quality and soil stability	●+	●+	●+	●+	●+	●+	●+	●	Soil	Decrease in soil quality Soil instability



Figure 21 The wide-ranging direct and indirect effects of multisectoral development in the Transboundary Landscape. Photo credits (clockwise from top left): Rio Tinto; Jeremy Holden/FFI; Jeremy Holden/FFI; Juan Pablo Moreiras/FFI; Elisabeth Villeneuve/FFI; Jeremy Holden/FFI; Elisabeth Villeneuve/FFI; Pippa Howard/FFI.

BOX 5: TAKING A CLOSER LOOK AT THE CUMULATIVE EFFECTS OF SMALL-SCALE DEFORESTATION EVENTS

Focusing in on the Ziama-Wonegizi-Wologizi forest complex (see below), specifically the northern part of Wonegizi, the potential cumulative effects of ongoing small-scale deforestation events on forest ecosystems in this landscape are explored. A recent landscape level assessment (FFI, 2020a) during the period between 2013 and 2019, found that both dense canopy and secondary forest cover have declined over this period by 6% and 9% respectively, while agricultural land uses have increased significantly due to the food security needs of a rapidly growing population. This has resulted in the **forest block in the north of Wonegizi becoming separated from the core area of forest**, with the remaining patches of forest cover within the encroached area becoming highly fragmented.



Location of the Ziama-Wonegizi-Wologizi forest complex, with the northern part of Wonegizi highlighted (green).

The extant forest at different time periods of analysis was classified by its function for connectivity, being broadly categorised as either core forest or exposed forest. Using the land cover and a background rate of recent historical deforestation, a model was developed to identify the forest areas at higher risk of conversion in the future. These risk values were based on a combination of parameters including forest type, proximity to roads, proximity to settlements, habitat function, slope of underlying topography and the density of historical deforestation events in the immediate square kilometre. The parameters were based on empirically derived evidence in the region and the different combinations identified the likelihood of the forest area being lost in the future.

When focussing on the northern forest blocks of Wonegizi (Figure A below), the historical deforestation that occurred during the assessment period is evident, with forest conversion and encroachment expanding from the centre of the once conjoined forest block. To assess the potential effects of future deforestation and land conversion in this landscape, using the deforestation risk of the extant forest (Figure B) in combination with the deforestation rate, the outputs from the landscape level assessment were subjected to an additional ten-year period of deforestation at the same historical rate. Based on known drivers of deforestation in the areas, this was assumed to result from small-scale agriculture and therefore the patterns of deforestation were

deemed small extents and more likely to occur in fragmented patches of forest or exposed forest in the main Wonegizi forest blocks; the output is illustrative only as in reality patterns of deforestation will be driven by a variety of additional parameters and decision making criteria. Figure C presents the outcomes of this projected future deforestation, with the changes to the classification of core and exposed forest classes and implications for future deforestation risk using the Morphological Spatial Pattern Analysis (MSPA) toolkit (Figure D).

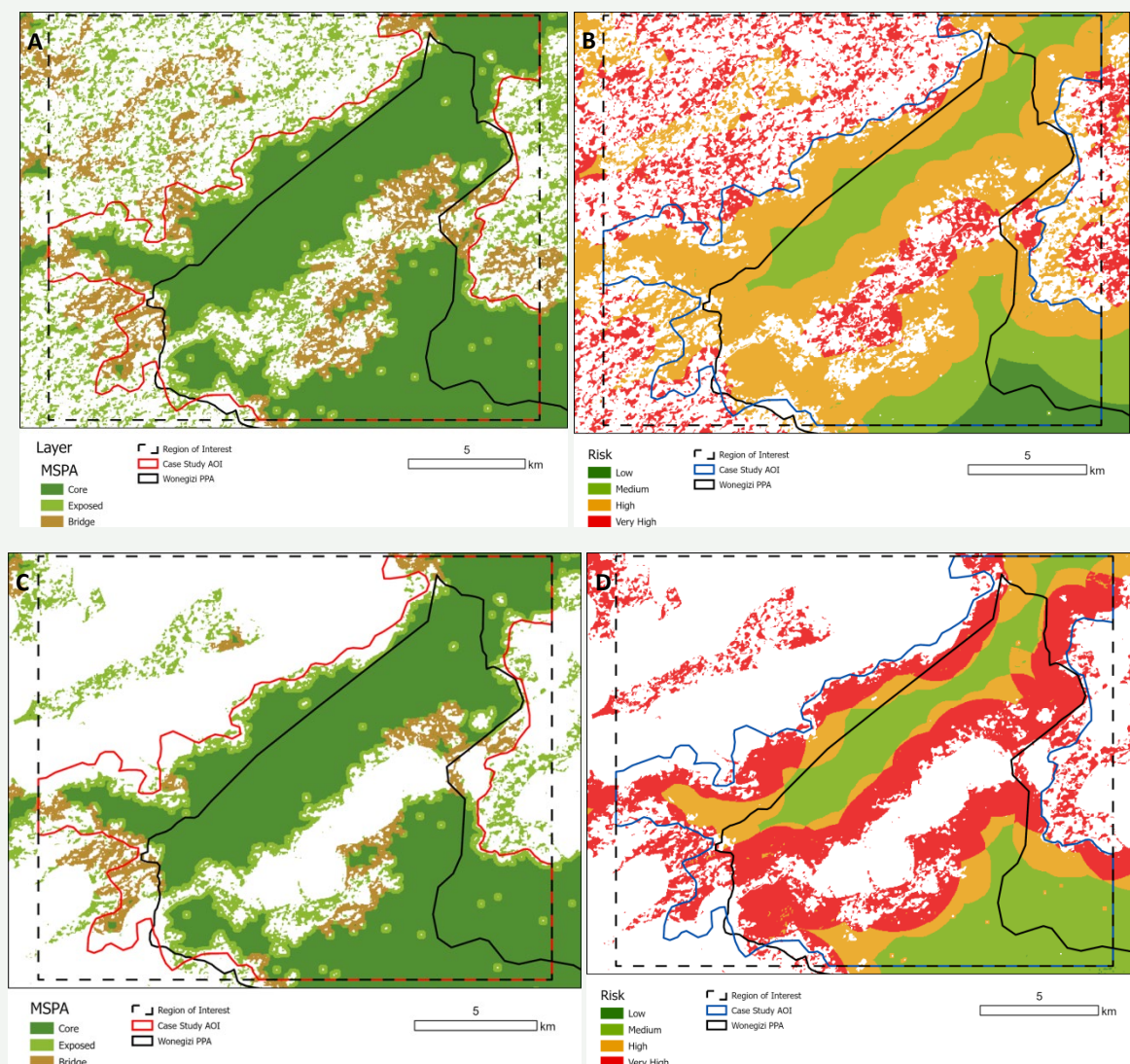


Figure legend: The extant forest in 2019, stratified by habitat function of core, edge and bridge habitat using the MSPA toolkit (Figure A - top left); the deforestation risk on the extant forest extent in 2019 (Figure B - top right). The projected forest extent after the predicted deforestation events over a ten-year period, stratified by habitat function of core, edge and bridge habitat; (Figure C - bottom left); the updated deforestation risk on the projected forest after the predicted deforestation event (Figure D - bottom right).

As small-scale areas of forest conversion take place the exposed forest is deforested, which in turn changes the shape of the forest margin, degrades the adjoining extant forest and encroaches on core forest in the forest patch (Figure C). If a single small-scale deforestation event is realised, the forest might be resilient to the impact without consequence on the integrity of the forest block, whereas the compounding effect of several small-scale deforestation events increases the overall effect on the extant forest. If this effect is combined with the impacts arising from other sectoral developments and stressors – such as road developments and infrastructure corridors - the cumulative effect on the extant forest will be far greater.

Any further deforestation and land conversion impacts on this projected extant forest in the northern Wonegizi landscape would have a compounding effect on the forest and increase the deforestation risk of

exposed forest in the forest blocks. This could see the integrity of the forest block impacted to a point where it is non-recoverable through any active restoration or natural regeneration. If the deforestation trends continue and another deforestation event of the same magnitude is afflicted on the extant forest (in Figure D), the function of the forest could be compromised so far that it is non-viable and does not support biodiversity and ecosystem services. In this landscape, there are two habitat corridors that link the two fragmented forest blocks of the Wonegizi forest; the connectivity function of these corridors is already compromised and would likely be lost if deforestation continues at the recent historical rate, in turn further isolating the integrity of the two fragmented forest blocks.

Such analysis highlights the importance of the application of the mitigation hierarchy across all drivers of forest loss and at multiple spatial scales. Mitigating the cumulative impacts caused by forest conversion and degradation needs to be supported at both the planning stages of Strategic Environmental Assessments (SEAs) and policy and the implementation stages of developments and land use management. Optimising both the location of developments and the management of land uses can be explored in scenario planning at a landscape level, following similar processes to the Ziama-Wonegizi-Wologizi landscape level assessment (FFI, 2020a) and supported by best practice guidance for conservation planning, SEAs and cumulative impact assessments.

It is important that cumulative impacts across the ZWW forest complex are integrated into a monitoring programme – under the responsible forest management agencies Centre Forestière de N'Zérékoré (CFZ) in Guinea and the Forest Development Agency (FDA) in Liberia with the pressures and activities causing the impacts evaluated over regular periods. Maintaining open dialogue and data sharing across this transboundary forest complex will also be crucial. The total area of forest, changes in the rate of habitat loss and analysis that identified habitat function and rates of fragmentation are informative indicators that assess both the cumulative impacts of land cover and land uses changes of multiple developments in addition to the compounding impacts from such developments on the extant habitat and biodiversity. This type of assessment can add indices that represent the compounding and cumulative effects of habitat clearance and encroachment and when coupled with an understanding of the drivers of this change, can inform land use planning and sustainable land management programmes.

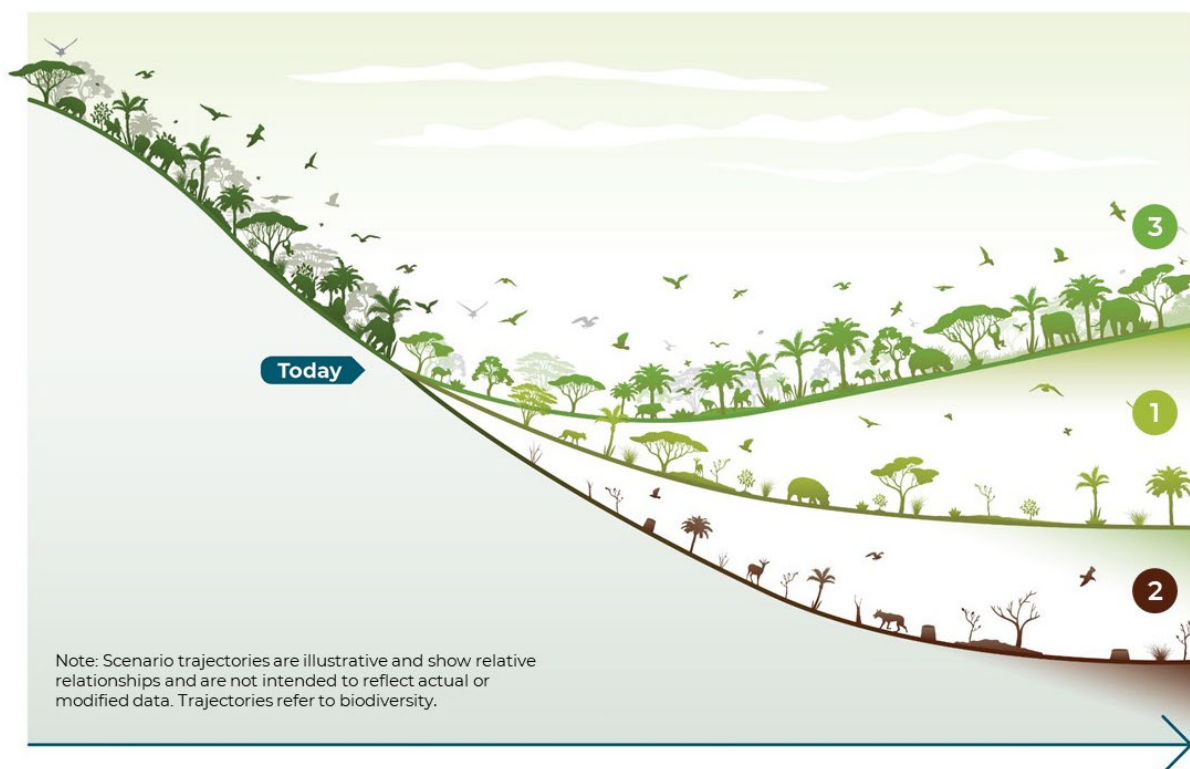
3.2 Future scenarios for biodiversity: Guinea Forestière

Given the issues outlined above what are the potential scenarios for biodiversity?

From this point forward the case study focuses in on a smaller area within the Transboundary Landscape, in the Guinea Forestière region of Guinea. In Guinea and other countries of the Transboundary Landscape, multi-sectoral development (mining, construction of dams, power lines and roads, agribusiness, forestry, etc.) is actively promoted by the national authorities and planned on a large-scale, with significant private investment and technical assistance. Stakeholder and biodiversity inclusive integrated land use planning is typically lacking, as evidenced in overlapping concessions, conflicting rights, and conflicts between land users and between land users and authorities. Many land use decisions in Guinea Forestière, particularly relating to the exploitation of mineral resources, have already been taken – in some cases several decades ago – with important biodiversity areas such as Pic du Fon already largely conceded for mineral exploitation.

Figure 22 (overleaf) considers potential business as usual and worst-case scenarios with associated outcomes for biodiversity and considers these alongside an improved alternative scenario.

Figure 22 Possible future scenarios and associated outcomes for biodiversity. Image adapted from [SDG Knowledge Hub](#) based on a paper by [Leclère, D., et al. 2020](#) in Nature.



	1 Business as usual scenario	2 Worst case scenario
Development trajectory	Development remains as it is currently: Planned expansion of agriculture and mining developments do not move into construction and production phases.	Economic growth prioritised at the expense of biodiversity and socioecological values: All planned developments move into production, notably large mining projects and associated infrastructure.
Impact assessment, mitigation planning and decision-making	Project-by-project basis with no landscape level strategic assessment or planning and variable enforcement of environmental and social safeguards.	As with business as usual
Mitigation hierarchy application	Requirements for mitigation hierarchy application remain limited to those activities and sectoral developments subject to ESIA and application on the ground is patchy at the project level.	As with business as usual
Indirect and cumulative impacts	<ul style="list-style-type: none"> • Rapid population growth due to high birth rates. • Unregulated conversion of natural habitat for agriculture and other unregulated land uses continue to increase. • Impacts continue to go unidentified, unmitigated and uncompensated. 	<ul style="list-style-type: none"> • Rapid population growth due to high birth rates and in-migration linked to mining/infrastructure. • Unregulated conversion of natural habitat for agriculture intensifies, particularly near new mines and infrastructure corridors. • Impacts go unidentified, unmitigated and uncompensated. Impacts aggregate and interact leading to significant cumulative effects.

3. An alternative scenario – a new business as usual

A new business as usual in which an enabling policy and legislative environment strengthens protections for known conservation priorities and supports the broad uptake and application of the mitigation hierarchy across all sectors to achieve national and/or landscape objectives (e.g. net gain for biodiversity, zero deforestation, land degradation neutrality, ecosystem restoration, etc.). This needs to be supported and actioned through a collaborative landscape approach to the prevention, mitigation and management of direct, induced and cumulative impacts of development activities and cross-sectoral contribution towards landscape objectives (e.g. relating to biodiversity, forests, ecosystem restoration, climate).

4 PRACTICAL CONSIDERATIONS FOR A NEW BUSINESS AS USUAL IN GUINEA FORESTIERE



STEP 3 Impact assessment and mitigation planning

STEP 1 | STEP 2 | **STEP 3** | STEP 4



STEP 4 Applying the mitigation hierarchy across a landscape

STEP 1 | STEP 2 | STEP 3 | **STEP 4**

Desk-based application of Steps 1 and 2 of the Framework builds a picture of the landscape, some of the species and ecosystem uses and values, and their distribution across the landscape. It highlights the work of others in identifying indicative conservation priorities, identifies some critical data and information gaps, and provides a current perspective on existing and emerging threats and pressures. This insight, coupled with understanding of the potential direct, indirect and cumulative effects of existing and planned development (Step 3), stresses that there is a critical window and urgent need for action to:

1. Prevent further impacts to known conservation priority areas and values in the landscape¹⁶.

Achieved through:

- strategic landscape application of the mitigation hierarchy
- strengthening and/or securing their protection
- managing existing threats and pressures
- supporting their enhancement (e.g. through targeted restoration of degraded habitat).

2. Maintain and improve functional connectivity outside of protected areas and classified forests and across borders¹⁷. Achieved through:

¹⁶ Only two of the classified forests in the Guinea Forestière part of the Transboundary Landscape are formal protected areas (Ziama MAB and Nimba Strict Nature Reserve and WHS), three have management plans in place (Ziama, Nimba and Pic du Fon) and none have long-term financing to support their management and the conservation of the biodiversity and ecosystem services values they support.

¹⁷ Patterns of deforestation coupled with recent movements of forest elephants and studies show that a large proportion of western chimpanzees (across their range) live outside high level protected areas, emphasising the critical importance of taking a landscape approach to conservation and development planning.

- coordinated and integrated management of sectoral development impacts, fully considering the effects of individual developments and their role in contributing to induced and cumulative effects across the wider landscape
- targeting mitigation measures and conservation activities beyond the boundaries of existing conservation areas to ensure long-term viability of relevant species. Ensuring actions are based on sound understanding of the social, cultural, economic and political factors influencing land use decision-making in relevant areas
- aligning transboundary conservation efforts for the management and protection of high conservation values identified across multiple border areas in the landscape.

3. Improve understanding of the landscape by addressing gaps in data and information in order to set appropriate actions¹⁸. Achieved through:

- prioritising increased understanding of existing functional connectivity between forests for a range of species and ecological functions
- understanding the social opportunities and constraints
- using this information together to implement actions that maintain and/or improve connectivity to secure viable populations of threatened species, the supply and flow of essential ecosystem services, and to strengthen landscape resilience.

This will require action both by landscape influencers (e.g. regulatory authorities) and land users (large and small-scale). A cross-sectoral, multi-stakeholder approach to define common objectives and identify practical solutions, partnerships and financing to mitigate and manage the impacts of project development and their cumulative effects on the landscape is needed. Steps 3 and 4 of the Conceptual Framework focus on project and landscape level mitigation planning, and the coordinated and collaborative delivery of mitigation action towards local and landscape objectives.

In this case study, the following sections focus on some of the practical considerations, barriers and opportunities for applying these steps of the Framework in Guinea Forestière. This includes who needs to be involved, the importance of understanding customary tenure and the influences and constraints for applying mitigation among smallholders; advances in the enabling environment at national and transboundary levels; and the critical role for industry.

4.1 Who needs to be involved?

There is complexity in the landscape and a need to engage with multiple levels of decision-making and stakeholders at national, landscape and local scales to manage and maintain a connected forest landscape. The following actors have been identified¹⁹ as having important roles to play in a collaborative landscape approach to impact mitigation and management with the goal of maintaining a connected forest landscape within Guinea Forestière and with contiguous transboundary forests:

¹⁸ Information on functional connectivity across this forest-agriculture mosaic is in its infancy and whilst some species, such as forest elephants, are thus far still able to move across the landscape, their movement is threatened by planned and unplanned development.

¹⁹ Based on desk-based assessment of the Transboundary Landscape context from an ecological, socio-economic and governance perspective, FFI's experience in the landscape, as well as learning from the COMBO initiatives and initial stakeholder analysis and engagement.

National authorities and inter-ministerial platforms

In Guinea Forestière this includes among others, the Guinean Ministry of Environment, Water and Forestry and the respective Ministries responsible for permitting and overseeing compliance across relevant economic sectors as well as responsible authorities in the ESIA process. National authorities and their respective decision-making responsibilities influence regional targets for sectoral growth, allocation of land and natural resource rights, requirements for and quality of ESIA's, and approaches to mitigation planning including application of the mitigation hierarchy. They also play a lead role in determining licensing conditions, monitoring and enforcement of compliance, and thus the delivery of planned mitigation actions and results in the landscape.

The recently established national multisectoral platform, Comité National pour la Compensation des Impacts sur la Biodiversité et les Ecosystèmes (CN-CIBE), which is representative of all sectors of the economy. The CN-CIBE has an important role in guiding the national approach to biodiversity offsetting and ecological compensation that will influence opportunities for achieving biodiversity conservation outcomes with private sector investment in the landscape and can be informed by practical experience and pilots in Guinea Forestière.

Forest management agencies: Centre Forestière de N'Zérékoré (CFZ) have responsibility for the management of most Classified Forests, except for Simandou and Mont Nimba, which are managed by the Centre for the Management of the Environment of Mount Nimba-Simandou (CEGENS) and have been conceded, mainly for mining. In terms of transboundary cooperation, this would involve the Forest Development Authority in Liberia.

Sub-national authorities

Local governments and traditional authorities will be important partners in landscape level collaborative processes and the delivery of action on the ground as they have a direct stake in the outcomes. Depending on the spatial scale of the process this may involve one or more local governments, and many traditional authorities.

Industry operators and their respective parent companies and lenders

In Guinea Forestière this includes among others: Société Guinéenne de Palmiers à Huile et d'Hévéa (Soguipah), ImpactAgri, Société des Mines de fer du Nimba (SMFG), Forêt Forte, Simfer SA, Winning Consortium Simandou and SRG Mining Inc., and their respective parent companies where appropriate. Industry operators are active stakeholders in the landscape, impacting on biodiversity and communities and with a responsibility to identify, prevent, mitigate and manage their environmental and social risks and impacts. Yet they also play pivotal roles as agents of development with potential to contribute in positive ways to landscape biodiversity, climate and forest objectives (e.g. through business expertise, investment to support strategic objectives, fulfilment of offset/compensation requirements, Corporate Social Responsibility investments, knowledge sharing, etc.).

Traditional authorities and local communities

Outside of Classified Forests and Protected Areas, customary governance of land and natural resources is pivotal in determining how land and resources are allocated, accessed and used. As local decision-makers, customary and formal rights holders, and as the most populous land user group in the Guinea Forestier landscape the inclusion of traditional authorities and local communities, including women and men and marginalised groups within communities, is essential in any landscape level approach to the mitigation and management of impacts on biodiversity and ecosystem services. Section 4.2 takes a closer look at the importance of engaging local governance actors and understanding customary tenure systems, focusing on the village of Bôo in the Ziama Man and Biosphere Reserve.

Other actors and initiatives

The engagement of other international, national and local actors (internal to the landscape and those that play a role in influencing the landscape) and initiatives active in the landscape and engaged in programmes that may influence the landscape is necessary to ensure complementarity of objectives and activities, efficiency in delivery (i.e. building on and extending progress made through complementary activities such as data compilation or institutional capacity building), and a coordinated approach to stakeholder engagement.

Examples of other international actors and initiatives include FFI, the COMBO Facility²⁰, various development agencies (e.g. World Bank, UK Government Department for International Development, Agence Française de Développement) among others. These actors can also play important roles in catalysing, facilitating and funding information gathering studies, multi-stakeholder and collaborative processes and platforms, and landscape partnerships.

4.2 Customary tenure in Guinea Forestière: Influences and constraints on smallholder land use decisions

An understanding of customary tenure and decision-making, as well as constraints on land use choices at the local scale must be central to inclusive planning processes, the design of impact mitigation, conservation and/or restoration plans that include lands under customary tenure, and the development of partnerships and collaborations.

In the Guinea Forestière landscape, smallholder agricultural encroachment is a major driver of deforestation and ecosystem degradation. Yet, smallholders are also the land users with the least agency in decision-making (Öborn et al., 2017). With the region's population growing rapidly, and given strong social, cultural and socio-economic ties to land and agriculture, the conversion of forest and other natural ecosystems for cultivation is expected to continue to increase. The expansion of small-scale agriculture is not formally regulated. Understanding the constraints and possible incentives for mitigating the adverse environmental impacts of smallholder agriculture is essential if actions to avoid, reduce and reverse impacts are to be implemented among smallholder communities. In turn, this understanding can help to inform the assessment of indirect, induced and cumulative impacts of large-scale development projects and the options available to mitigate and manage them.

To better understand how decisions relating to land access and use are made at the village smallholder level, residents of the forest enclave community of Bôo, in Guinea Forestière's Ziama MAB Reserve (Figure 23), were consulted in a three-day focus group and interview process²¹. The objective was to build to on the findings of the ZWW landscape assessment to better understand how land decisions are made in Ziama MAB Reserve villages, where residents have restrictions on their land use decision-making at many levels (e.g. at the individual farmer, community, local leadership, or government level), and how this affects options and incentives for mitigating negative impacts at the village smallholder level.

²⁰ The 'Conservation, impact Mitigation and Biodiversity Offsets in Africa' (COMBO) project, now referred to COMBO Facility (<http://combo-africa.org/>) works across four countries in Africa, including Guinea, Madagascar, Mozambique and Uganda, to build capacity and strengthen relevant decision-making frameworks to expand and strengthen the application of the mitigation hierarchy. The activities and outcomes of the COMBO project in Guinea are particularly relevant as they provide an important foundation and ongoing programme to support the improvement of institutional capacity, policies and inter-ministerial coordination that are necessary to facilitate the uptake of this framework.

²¹ 7-9 October, 2020

Ziama Reserve and Bôo village

Ziama's history has been tumultuous, with its delimitation as a Classified Forest being a colonial decision that impacted the traditional lives and livelihoods of residents by significantly reducing their access to cultivable land (Fairhead & Leach, 1994). Bôo was established as a village in 1803 by Kouekoro Toupou; by 1870 the village was a Toma²² stronghold of 5,000 residents. Area population records are then sparse until after the delimitation of the Ziama classified forest in 1932, when the recorded population of Bôo had fallen to 543 individuals. There is no record of whether the population diminished naturally, as a result of war, or if residents were relocated or asked to leave by colonial powers (Fairhead & Leach, 1994).

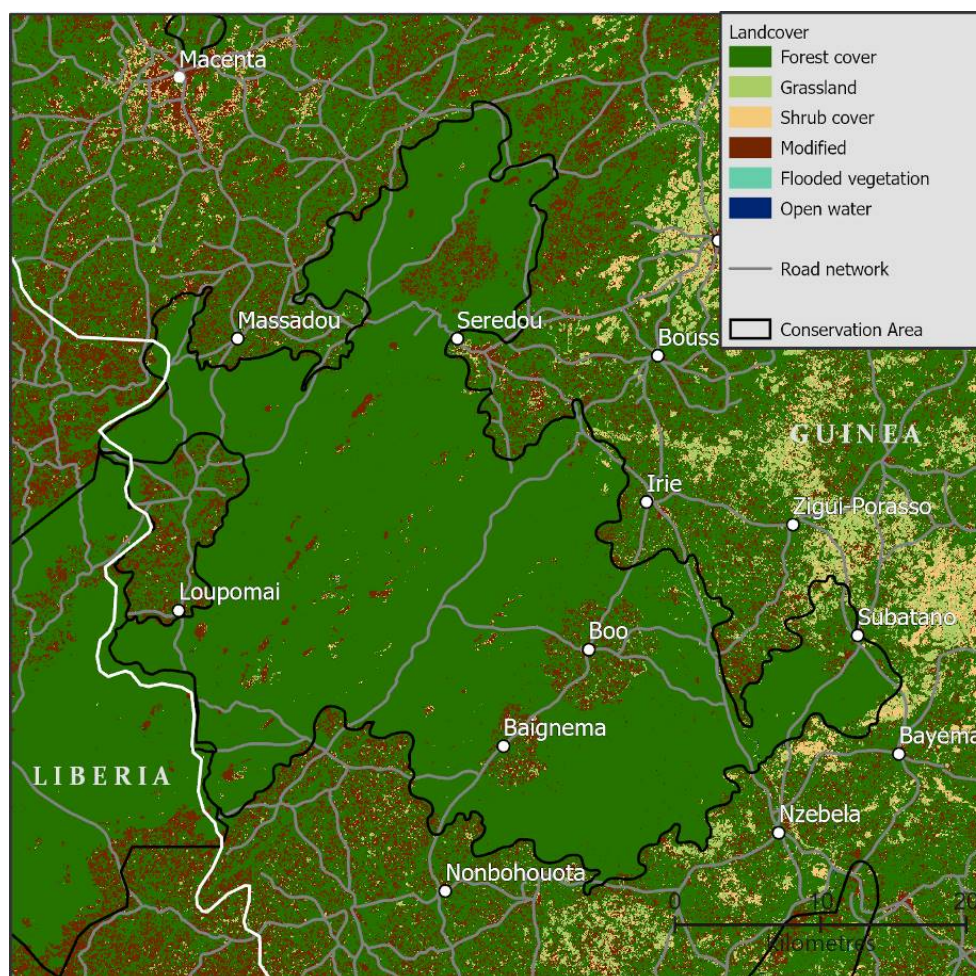


Figure 23 Location of the forest enclave community of Bôo in the Ziama Man and Biosphere Reserve

The original boundaries of the Ziama Classified Forest received local resistance, particularly from Bôo, and in 1943 the limits were altered to accord local residents more cultivable land. This second delimitation allowed the village of Bôo to remain within Ziama as a forest enclave community. Today, the population of Bôo is 2,005 individuals, distributed into seven clans and 286 households over 3,800 ha. 99% of the population are of

²² The Toma of Bôo are very closely related to the Loma of Liberia, and those of the Loma lineage in Guinea are often referred to as Loma; the residents of Boo to whom we spoke referred to themselves as Toma, and so we have conserved this preference in the text when referring to Bôo.

animist and less than 5% are involved in organised religion. The average number of people per household is 9.43, with an average of three children under five years old per household and 1.3 additional dependents ²³.

Rice cultivation in forest wetlands

The land cover around Bôo shows a fractured band of dense canopy forest with evidence of agricultural encroachment into the reserve. The forest has radiating patterns of clearance that follow drainage lines, reflecting the practice of seasonal rice cultivation in the forest's wetlands. Despite the gazettement of Ziama, rice cultivation in the protected wetlands has continued relatively unabated; in some cases it was allowed or even promoted (Rangé, 2017). As a result, there is a population of about 800+ people actively cultivating rice in the core and buffer zone wetlands. With the national verification of the Ziama MAB Management Plan in 2019, rice cultivation in the Reserve wetlands is now illegal (as opposed to prohibited by the forest management authority, CFZ), causing a complex situation in which conservation goals, land tenure systems and food security concerns compete. Many or most of the Reserve wetland farmers have been relying upon these protected area yields for decades and are unable to meet their food security needs without access, or support to establish a new income stream. FFI records from 2018 show that 130 ha within the protected zones of the reserve are under cultivation by the residents of Bôo.

Customary governance

Bôo has three levels of local leadership: district level, village level (customary), and clan level:

- **District leadership** conforms to statutory procedures, and as such, District representatives are chosen by election. In the Ziama area there are five election districts; Bôo sits in the electoral district headquartered in Sereidou.
- **Customary leadership** sits at the village level. Customary leaders are designated such according to their ancestors- the current customary chief of Bôo is from the founder's lineage (the family name of Toupou). Because traditional leadership is transmitted from generation to generation, there is no mandate or term expiry; when a leader dies, the eldest son or eldest male from the lineage takes on the leadership position. The authorities of a village, which include sages as counsel, are selected and appointed by the customary leader.
- **Clan leadership** is similar to customary leadership in that leadership is inherited. Clans represent large family groups, and in Bôo several clans are represented, responsible for making decisions at the family and neighbourhood levels (Figure 24). For example, a clan leader has authority over the communal lands in their neighbourhood, but not in the neighbourhood of another clan. Family disputes and small agricultural issues are handled at the clan level.



Figure 24 Levels of decision-making in the customary governance of Bôo

²³ 2020 village census; 2019 FFI householder survey; World Bank 1994; Oct 7-9 2020 consultation

Customary land tenure

Generally, systems of land tenure dictate not only who has access to a parcel of land and its products, but for how long individuals or groups can access it and how it is used. Guinea's land is governed by a layered and complex legal system, in which customary and statutory systems overlap. Statutory systems involve written, codified rules dictating who has access and for what. Customary systems are more informal, based on community understanding and tradition. Where there are issues with tenure, this can exacerbate environmental impacts and make the implementation of the mitigation hierarchy more difficult or less likely, as uncertainty can reduce the incentive for individuals or groups to invest time, thought and/or energy into making sustainable land use conversion choices.

BOX 6: TYPES OF PROPERTY RIGHTS

Customary tenure generally has procedures for the allocation of property rights encompassing the following (FAO, 2012):

Use rights: rights to use the land for grazing, growing subsistence crops, gathering minor forestry products, etc. Time-bound.

Control rights: rights to make decisions how the land should be used including deciding what crops should be planted, and to benefit financially from the sale of crops, etc. This might be the same person who holds transfer rights, or it might be someone else (e.g. wife, son of the transfer rights holder).

Transfer rights: right to sell or mortgage the land, to convey the land to others through intra-community reallocations, to transmit the land to heirs through inheritance, and to reallocate use and control rights. Akin to formalized ownership, but land is not statutorily titled.

The majority of Bôo's residents have use rights for their agricultural land; the minority have control rights, and few have transfer rights (see Box 6 for definitions). Although land tenure systems in the Ziama area can take on a transactional form in some villages' customary systems, in Bôo this is not the case; most land in Bôo is either communally owned at some level or has been passed down intrafamily via inheritance. Notably, there is no private land ownership in Bôo and land sales are strictly forbidden. Each head of household must safeguard the estate that he has received from his ancestors, to pass it on in turn to his children, who "inherit it by right"²⁴.

Toma customary law, as practiced in Bôo, considers property to be a family asset, administered by the family head, who is usually a man. Access to land may be gained through inheritance, marriage, use agreement or renting. The exact manner in which rights to land are actually distributed and enjoyed is much more complex than that, however; within a family, a woman may have use rights for growing annual subsistence crops to feed the household, with her husband having control rights, allocating use rights for land under tree crop production to the men of the household. In another household the arrangement might be different.

²⁴ « Chaque chef de ménage se bat pour sauvegarder le domaine que lui-même a reçu de ses parents pour les transmettre à son tour à ses enfants qui les hérite de plein droit. » Abass Camara and Jonas Siba Dopavogui, FFI field staff, October 2020.

The value of forest land in the Toma culture

Land in Toma culture is not just a reference to physical terrain, but to an area of community decision-making that allows for social and political relationships to be defined (Fairhead & Leach, 1994). Ziama farmers have been reported to have cleared land inside the Reserve for the purpose of “re-stak[ing] old social political claims to ruined village territory now within the reserve” (Fairhead & Leach, 1994).

In Bôo, the value of land is not related to formal titling, as none of the 3,800 ha comprising the village are formally titled, and no resident has the right to transfer land in Bôo to those outside of the village. When asked about the value of the Ziama forest and its services to them, residents of Bôo express sentiments that are almost universally references to ecosystem services:

“The big trees prevent the wind from blowing in the village.”

“Because of the forest the rain is abundant, the good wind blows.”

“From the Ziama forest, we benefit from rain and medicine we need.”

Free-input responses from Bôo residents in Ziama household survey 2019 (FFI)

Ten percent of the residents of Bôo state that access to medicinal plants in the Ziama forest’s buffer zone is the primary ecosystem service that the Ziama forest provides for them and 89% of Bôo residents surveyed state that rain, clean air and/or climate regulation are the ecosystem services they rely upon²⁵.

The importance of sacred forests (community forests) for worship and ritual purposes was also highlighted. When asked about sacred forest management, residents described that “each forest of worship requires a certain rule and laws that are inviolable and accepted by all.” These community domains belong to the whole village, and are managed by specific customary leaders, one man and one woman, according to ancestral customs. The male leader manages sacred forest activities for the male forest, and the woman for the female. A sacred forest may be a larger forest block that is conceptually divided into male and female areas, or it may be two separate forests (a male forest and a female forest).

“No cultivation is permitted in sacred forests. Any violation of the principles of the management of the forests of worship is an infringement of the authority of the village and is liable to a disciplinary sanction commensurate with the act committed.”

Bôo leadership, 2020

Gender, inheritance, and tenure

Inheritance is a right of male children in Toma culture, and 80% of consulted households stated that only eldest sons have rights to land because they carry the family name; upon inheritance, it is then the eldest son’s task to split the land fairly amongst his brothers. One respondent stated that “*Girls are made for other families, if you give them land they will not join their households*”, or in other words, women are expected to access land via marriage. On the other hand, 20% of the households surveyed reported that all children have the right to inheritance: “*One does not choose the sex of the child because it is God who gives*”. One landowner²⁶ stated that his wife would inherit his land, with the promise of then bequeathing it to their sons. Consulted households were asked if land-use decisions are made executively by the head of household, or in

²⁵ The remaining 1% claimed food (wild meat) as the primary forest service: “In the forest, I find a little bit of food”, “The animals in the forest serve as food for us.” (FFI, 2019)

²⁶ In this text, ‘landowner’ refers to the one with control rights.

collaboration as a family. Of the landowners consulted 67% preferred to make executive decisions themselves, while 33% preferred to consult with their families and household members.

Those who do not have access to sufficient land to meet their food security needs must farm communally, as well as borrow or lease the land they require. For those who lack sufficient land the reasons can vary; sometimes it's due to being recent immigrants to the area, sometimes it's due to generational divisions leaving little left. In 2019, FFI surveyed a subset of farmers cultivating illegally in the Reserve wetlands, asking them about their reasons for being there. Of the respondents, 22% were from Bôo, and this subset had been farming in the Reserve for an average of 9.5 years. All reported to be supplementing household income for food security reasons.

Thus it is understood that the heads of household and customary leader hold most decision-making power over the distribution and use of land in Bôo, and that these nominal titles are near-universally held by men; however, some men state that they will accord transfer rights to female children and spouses upon death.

Focus group discussions with the women and men of Bôo highlighted that both groups generally feel they have access to land, but all agree that men and/or community leaders maintain control over the land. In most cases, men/community leaders make the decisions over the use of the land. They also decide who, how much, and what quality of the land that women are entitled to. Female farmers in Bôo shared that although the men/community's control is evolving, women were still highly subject to men's control in a multitude of areas.

In response to the prompt "I'd like to be a man because...", a female resident of Bôo responded "...I wish I had more authority without limits to perform tasks such as cutting down trees and clearing land without paying contractors."

Bilivogui, 2019

Gender-based constraints are defined as barriers to socio-economic participation that exist **in addition to** poverty and the social problems that men also face. In the context of land tenure, both women and men may suffer from a general constraint of small land holdings, however women in Bôo face an additional barrier of customs that restrict women's access (use of land) and control (ownership) of land as an asset. This is consistent with national-level indices confirming that access to land in Guinea remains a key barrier for women smallholder farmers to achieve parity in the equal distribution of economic and natural resources (OECD, 2019).

There are additional serious and systemic implications to this disparity as well: ultimately, a lack of land tenure impacts a woman's ability to access formal credit, as finance institutions generally rely upon asset-based lending. That is, women have less ability to use property as collateral, limiting their access to credit. This, in turn, can affect a woman's ability to access required agricultural inputs, which in turn decreases productivity and increases incentive to deforest or farm illegally.

What does this mean for mitigating environmental impacts at the village level?

The ZWW Landscape Level Assessment made the following recommendations to stem the degradation seen in the forest edges around Bôo:

- Prevent further agricultural encroachment and degradation into forested areas within this zone. Sustainable yield intensification and reduced extraction of forest products should be considered.
- Restore removed and degraded forest in areas associated with Bôo and surrounding communities, to improve/restore connectivity.

When directly asked what the constraints to ecologically-sensitive land use decision-making are for them, the universally-stated constraint given by residents of Bôo was land size and availability of land. The majority of Bôo's residents are farmers, and restricted land sizes mean restricted yields. This is compounded by succession

and inheritance, which reduces landholdings per household at each generation, and further marginalizes female smallholders. It was also noted that requests for access to, and loans of, land are on the rise in Bôo:

“Leave us the wetlands for our crops.”

“Let us exploit the forest or bring us help.”

“Give us a piece of forest for our crops.”

It is clear that smallholders in Bôo value the forest and the ecosystem services it provides. The interest in forest conservation exists for 99% of Bôo’s residents, but for this group, conservation cannot be prioritised over agricultural priorities in a business-as-usual situation. Smallholder farmers on the whole are an extremely risk-averse group; understandably so, as the health and well-being of a smallholder household rests upon the yields achieved in each agricultural season. The incentive to consider mitigation hierarchy principles in land-use decision-making is reduced as a result of this, as immediate food security concerns understandably override long-term environmental concerns.

This barrier can be overcome, however, by recognising this fundamental conflict at the conservation-agriculture nexus and addressing the lack of incentive that smallholders have to apply mitigation principles. Payment for ecosystem services (PES) schemes can fill this gap, by compensating smallholders for the cost, time, effort and risk involved in forest conservation. However, PES schemes can potentially shut out female farmers due to their lack of formal access to land. Thus, in any PES scheme, there is the need to enact measures that respect customary authority while also supporting the inclusion of female smallholders.

In terms of being able to impact decision-makers at the village smallholder level, working with the customary leader and clan leaders would likely have the highest impact, as they have direct influence over the heads of household. By working with customary chiefs and clan chiefs on understanding the benefits of applying the mitigation hierarchy, it may be possible to sow the seeds of long-term change.

4.3 Creating an enabling environment: National and transboundary

It is a key role of government, both national and transboundary, to provide the enabling environment for industry and other stakeholders to apply the mitigation hierarchy.

Recent advances at the national level: the critical role of government

This case study and the Conceptual Framework focus at the landscape level. However, the influence of political will, national laws and policies, institutional capacity, and inter-ministerial coordination is central in enabling uptake of the Conceptual Framework and its application in the landscape. There are many barriers yet, at a national level in Guinea, there are several notable legal, policy, technical and institutional advances that may contribute to a more supportive enabling environment including:

- On December 17th 2020, Guinea’s Ministry of Environment, Water and Forests announced that the boundaries of all classified forests in Guinea would be redrawn, noting that existing boundaries were implemented by the French under colonial rule. The new boundaries will be drawn to reflect the needs of forest-adjacent communities, and will be undertaken within the spirit of “vigorous action to protect our forests to reverse the trend of this continuing destruction” (Mosaique Guinee, 2020).
- Legal establishment of the national multi-sectoral platform, CN-CIBE, established by decree in 2017 under the chairmanship of the Ministry of Environment, Water and Forests, and for which the COMBO project provided the secretariat. The CN-CIBE has an important role in guiding the national approach to biodiversity offsetting and ecological compensation.

- Revision of the Environment Code in 2019 explicitly incorporated the concept of the mitigation hierarchy, with supporting regulatory text planned for 2020-2021 to specify the requirements for the implementation of the mitigation hierarchy including biodiversity offsetting.
- Recent development and formal adoption of the '*National Strategy for the Implementation of the Mitigation Hierarchy and Compensation of Impacts on Biodiversity and Ecosystems*' which establishes principles and a roadmap for the implementation of the mitigation hierarchy and no net loss / net gain of biodiversity at the national level (Box 7). The revised Environment Code will support implementation of the national strategy. A key recommendation of the national strategy is for the extension of the mitigation hierarchy to Local Development Plans and smaller projects not usually subject to impact assessment, to ensure that developments across all sectors are mitigating impacts and local decision-making processes are strengthened.
- Precedent established in Guinea for private sector investment in biodiversity offsets to serve as a mechanism for securing protection of conservation priority areas, as demonstrated by the creation of the Moyon Bafing National Park (see Section 4.4, below).
- An updated [National Action Plan for the conservation of chimpanzees in Guinea](#) for the period 2020-2030 has been published. The plan provides a shared vision, whereby chimpanzee populations of Guinea and their natural habitats are preserved and restored through a strong commitment to sustainable development from the state, local and international communities, and by extractive and productive sectors.

Significant challenges for implementation of the national strategy for implementing the mitigation hierarchy and revised Environment Code remain. This includes the need to build the necessary awareness, knowledge, incentives and capacity to stimulate and enforce broad uptake and robust application of the mitigation hierarchy by all industry operators. It will also be essential to enable and support non-industry stakeholders to reduce and manage their respective impacts, particularly where these are collectively driving deforestation and ecosystem degradation, as is the case in Guinea Forestière.

Transboundary cooperation

Notable advances in transboundary collaboration are also being made. This includes for example, the signing in October 2019 of a ground-breaking bilateral agreement and operational protocol between the governments of Guinea and Liberia for the conservation of the Ziama-Wonegizi-Wologizi forest landscape complex (USAID, 2019) - a process brokered by FFI and partners. This bilateral partnership is fundamental in underpinning collaborative transboundary management to strengthen forest governance, law enforcement, reduce deforestation and promote the restoration of degraded forest lands.

The importance of this collaboration, and others including the transboundary management agreement for Tai-Grebo-Krahn-Sapo between Liberia and Côte d'Ivoire, has been demonstrated and put to the test this year as two male forest elephants recently crossed the border from Guinea into Liberia and onwards into Côte d'Ivoire – traversing a mosaic of land-use types, including forest fragments and agricultural landscapes, in order to reach forests further afield (FFI, 2020b). Transboundary agreements have been critical in enabling the activation of communication and collaborative working among the various forest and wildlife management agencies to monitor and safeguard the elephants on their travels²⁷ and for the first time the governments of these three countries in the Mano River Union – which also includes Sierra Leone – have come together to safeguard wildlife migrating across their borders (FFI, 2020c).

²⁷ Guinea's CFZ, Liberia's Forestry Development Authority (FDA) and Côte d'Ivoire's Ministère des Eaux et Forêts (MINEF)

BOX 7: A NEW NATIONAL STRATEGY FOR THE IMPLEMENTATION OF THE MITIGATION HIERARCHY AND COMPENSATION OF IMPACTS ON SPECIES AND ECOSYSTEMS

The Guinean Ministry of Environment, Water and Forestry, supported by the COMBO Project, defined six key principles central to the national strategy for the implementation of the mitigation hierarchy²⁸. This includes:

- Improving the knowledge of biodiversity through updating and generating accessible data and information.
- Building upon existing regulation and decision-making processes by aligning with best practice approaches on implementation of the mitigation hierarchy.
- Integrating biodiversity and the mitigation hierarchy into policies across all sectors.
- Strengthening involvement and support of a wider range of stakeholders in the application of the mitigation hierarchy and decision-making frameworks.
- Using compensation requirements (i.e. biodiversity offsetting) to expand the protected area network and contribute to national restoration and biodiversity improvement objectives.
- Explore and strengthen the financial and technical capacity within the ministry and across stakeholders to ensure robust application of the mitigation hierarchy.

A road map to support the implementation of these principles and achievement of objectives has been developed and a number of strategic directions were identified and prioritised, including, for example:

- Identification of existing regulations, laws and decrees for which the mitigation hierarchy can be integrated such as the commitment to the mitigation hierarchy in the Environment Code and the requirement for consideration in environmental and social management plans submitted according to impact assessments, applications and licensing requirements.
- Extension of the mitigation hierarchy to Local Development Plans and smaller projects not usually subject to impact assessment, to ensure that developments across all sectors are mitigating impacts and local decision-making processes are strengthened.
- Identification of areas of high ecological value that are priorities for conservation at the national level and promoting avoidance of impacts to these areas through integration in local planning processes, dissemination of information to all stakeholders (including donors, project developers and civil society) and establishing assurance mechanisms.
- Integrating commitments to sustainable development, equitable benefits and community rights into the laws and policies for the implementation of the mitigation hierarchy.
- Developing methodologies and approaches to the identification and implementation of compensation actions as part of the mitigation hierarchy, specific to the Guinean context.

Moving forward, the mitigation hierarchy and compensation approaches will be implemented under the regulatory and legal frameworks and national development plans across all development sectors in the country. There is a recognised need to develop partnerships and case studies to test and develop these required actions, including through pilot projects in priority landscapes. Opportunity therefore exists to take this case study forward to application and to pilot the Conceptual Framework to contribute towards implementation of the national strategy and roadmap.

²⁸ Ministère de l'Environnement, des Eaux et Forêts, République de Guinée, Novembre 2019. Stratégie nationale pour la mise en œuvre de la hiérarchie d'atténuation et la compensation des impacts sur la biodiversité et les écosystèmes.

4.4 Applying the mitigation hierarchy across the landscape: a critical role for industry

Identify, mitigate and manage the full range of project impacts

To date in Guinea, commitments to best or improved practice, notably in the mining sector, have often been driven by corporate policy and/or conditions of finance that require adherence to international best practice such as the International Finance Corporations (IFC's) Performance Standards (World Bank, 2019a; Barry et al., 2021).

All large-scale mining projects are required by law to undertake an ESIA and to mitigate and manage their respective impacts on the environment and society

Whilst planned large-scale mines in Guinea Forestière are yet to enter construction, many are poised to advance mine development and associated transport infrastructure (roads, rail, ports) in the next five years based on signed agreements with the government, subject to further approvals. All are required by law to undertake an ESIA and to mitigate and manage their respective impacts on the environment and society. Some ESIA's have already been undertaken, need updating, are ongoing and/or will be required in future. The quality of ESIA's, related environmental management plans and their effective implementation, is expected to vary markedly between operators. There are also recognised constraints on the effectiveness of the current ESIA process (World Bank, 2019a).

National Strategy for the Implementation of the Mitigation Hierarchy and Compensation of Impacts on Biodiversity and Ecosystems

The recently adopted 'National Strategy for the Implementation of the Mitigation Hierarchy and Compensation of Impacts on Biodiversity and Ecosystems' and revised Environment Code will require the implementation of the mitigation hierarchy across all sectors, including requirements for biodiversity offsetting or ecological compensation. However, there are very mixed levels of awareness and uptake of the mitigation hierarchy and objectives-led approaches. Commitments to implement best practice impact mitigation and management varies considerably among operators (and their respective parent companies).

Apply best practice environmental and social safeguards

Not all will be required—either through conditions of finance, corporate policy or certification standards—**to adhere to international best practice standards** (IFC or equivalent) to support environmental and social sustainability. In Guinea Forestière's mining sector there are notable examples of operators striving to fulfil international best practice requirements. In other sectors there is some indication that commitments to avoid, reduce and rehabilitate or reforest impacted areas have been integrated into company environmental and social policy (Box 8).

Yet **even where companies do show uptake, this can be undermined by less informed or less scrupulous actors** and some operators reported the conflicting agendas of different sectoral activities (e.g. mining

operators prospecting in ecological areas protected by agribusiness; mine access routes intersecting with sensitive watercourses avoided by agribusiness etc.).

Conflicting agendas and the potential for mitigation efforts and objectives to be quickly undermined by other operators, is a growing concern in Guinea Forestière and in the context of the wider Transboundary Landscape. For example, recent reports from Liberia document the activity of mining company, Solway Mining Incorporated, which was issued an exploration permit encompassing the Blei community forest, with activities of the mining company undermining decades of aid investment and community forest conservation (Mukpo & Giahvue, 2020). Some operators in their operations and/or their respective parent companies elsewhere have demonstrated a blatant **disregard for social and environmental safeguards** (for example see: Wormington, 2018; CECIDE, 2020; Wahlquist, 2020) and there is grave concern that this will be replicated in highly sensitive operating sites in Guinea Forestière. The potential for devastating consequences for biodiversity, ecosystem health and services, and for rural communities is high.

Individually, **all industry actors regardless of sector need to adopt best practice** to avoid, reduce, restore and compensate for their respective impacts. This is of paramount importance given the sensitivity of sites targeted for development of mines and linear infrastructure. Crucially, industry operators investing in, benefitting from and impacting the landscape, **must take responsibility not only for the impacts arising from the footprint** of the operation and its associated infrastructure and activities, **but also for the impacts that result from the presence of the mine**, plantation, logging concession, road, rail or powerline. For example, can mining operators around Mount Nimba help to secure its high value biodiversity by managing potential induced impacts associated with the mines and contributing towards the management of other threats and pressures? Where effective strategies are developed for managing induced and cumulative effects, how can these be scaled up or replicated by other operators and in other parts of the landscape?

Operators must look beyond the fence of their respective site and activities to the wider landscape to understand the implications of planned development and activities – not in isolation but in conjunction with other regulated and unregulated land uses – and to identify options to address these. All individual operators must **own responsibility for mitigating and managing induced impacts**.

Strong government oversight and rigorous, consistent enforcement of policies and laws

This **requires strong government oversight and rigorous, consistent enforcement** of policies and laws, with heavy sanctions for non-compliance as well as pressure from other operators and civil society. All industry operators must be accountable and be held to account, by government, other industry operators and civil society, for mitigating and managing their respective impacts. Without this, the direct, indirect and cumulative impacts of mining, associated infrastructure development and induced growth in other sectors on species, ecosystems, local communities and landscape resilience will be significant.

BOX 8: EXAMPLES OF SOGUIPAH'S COMMITMENTS TO AVOID, REDUCE AND RESTORE IMPACTS FROM ITS OIL PALM AND RUBBER PLANTATIONS ON THE ENVIRONMENT

As articulated in the company's environmental policy and through interview²⁹

Avoid:

- UNESCO World Heritage Sites and Ramsar wetlands will not be converted to palm plantations.
- Community forests (including sacred forests), classified forests and in reforestation areas
- Headwaters (as protected by law) and gallery forests
- Extensive planting on steep slopes and/or marginal and fragile soils
- Use of fires for waste disposal and clearing prior to replanting (except in special cases in line with best practice guidance)
- Support the protection of community forests and sacred forests
- Request smallholder producers to maintain a buffer of 50-100 meters from the river
- Since late 2005, the company reports that new palms have not replaced primary forests or areas of High Conservation Value.

Reduce:

- Waste management including the recycling of solid waste for use as soil fertiliser or fuel in the oil mill's boilers
- Cover cropping to enrich the soil, reduce erosion and manage reduce the need for agrochemicals
- Support smallholders to optimise the use of limited land areas through crop intensification.

Rehabilitate/Restore:

- Reforestation undertaken across a total of 3,225 ha of land, including reforestation of small parcels by smallholders. Reforested areas must not be subject to future impacts.
- Rehabilitation of degraded areas
- Slopes that formerly used for slash-and-burn agriculture enriched with forest species for timber.

Additional conservation actions include providing logistical support to the State forest services with the objective of strengthening the monitoring of forests, particularly around headwaters and hill areas.

Sources: Interviews with Soguipah representatives, 2020; Soguipah, 2019.

Cross-sectoral collaboration to address induced and cumulative effects

There is a need to bring landscape actors together in a pre-competitive space to develop a shared understanding of the impacts of different land uses, how they may aggregate and interact to create cumulative effects, particularly when assessed in the context of other threats and pressures, and to find solutions.

Currently few, if any, formal mechanisms are in place to foster sectoral or cross-sectoral coordination and collaboration in this landscape. Yet addressing induced and cumulative impacts, such as those arising from improved access to the area and in-migration resulting from the presence of a new mine, is challenging and will further require active cross-sectoral coordination and collaboration, in partnership with government and with local communities. There is precedent for the establishment of sectoral platforms elsewhere in Guinea

²⁹ It was beyond the scope of this case study to verify written and interview reports.

(see Barry et al., 2021) and transboundary communication and cooperation has also been enabled to support cross-border conservation and management of threatened wildlife.

Box 9 illustrates an example of **bilateral cross-sectoral collaboration to help pre-empt and address potential induced and cumulative effects** for biodiversity and people in the landscape. Expanding this to a broader cross-sectoral collaborative platform that can help to break down barriers of communication, build knowledge and capacity, and foster shared learning and collaborative approaches to impact mitigation is strongly recommended.

BOX 9: CROSS SECTORAL COLLABORATION BETWEEN MINING OPERATIONS AND AGRIBUSINESS MOTIVATED BY COMPLEMENTARY INTERESTS AND OBJECTIVES

In multi-use landscapes, a major challenge is how to improve the integration of smallholder agriculture and larger industry to meet their respective objectives. How can agribusiness be designed to support regenerative agriculture, be socially inclusive with minimum land ownership, and support environmental objectives in the landscape? ImpactAgri is a for-profit venture that brings together major companies, investors and stakeholders, to establish agricultural enterprises with secure market access that are socially inclusive with active participation of local farmers and communities and environmentally sustainable.

Securing seed financing presents a major challenge yet also an opportunity to partner with extractives operators. For a mining company, the indirect social and environmental impacts of the mine being present in the landscape (e.g. inducing in-migration to sensitive areas around the mine) present a major challenge that is often far greater than the impacts of the mine footprint itself. Mining companies have social and environmental commitments and must manage the risks posed by induced and cumulative effects and maintain their social license to operate.

ImpactAgri's model offers a potential solution that can deliver on multiple objectives for the mine, whilst meeting the needs of local communities and a growing population (and associated demands on food production). The model emphasises the importance of setting up businesses that are socially and financially viable over the long-term. Agribusinesses are established as stand-alone ventures, designed to meet commercial and environmental parameters, so that they can thrive over the long-term - independent of and beyond the lifetime of a mine. Environmental considerations are built into the design process from the outside and there is a strong emphasis on soil management, agroforestry and clean energy processing solutions. Building the value add to existing crops produced in the landscape is an important component of business design with the aim of delivering multiple benefits (e.g. processing raw commodities using renewable technologies that reduces dependencies on woodfuel, and delivers benefits for human health, forests and biodiversity).

In the context of ape landscapes, this model may prove critical in helping to balance the multiple threats facing apes and their habitat with the needs of rapidly growing human communities and a national drive for sectors such as mining to catalyse economic development in other industries. For example, the strategic siting of socially inclusive agribusiness can help to draw human activity away from the mine and away from areas that are important for biodiversity and other ecosystem values (e.g. forests with high biodiversity and carbon value, protected areas, wildlife corridors, headwaters) by providing an attractive, sustainable and resilient livelihood option. The promotion of agroforestry-based farming systems can further support the regeneration of degraded lands, provide longer-term business opportunities for communities, and contribute towards food security, climate and biodiversity objectives.

For more information see [impactagri.com](https://www.impactagri.com)

Addressing cumulative impacts was the main driver for the creation of the sectoral network 'Réseau Environment Bauxite' in the Boké region in north western Guinea which was formally established in 2018 and currently has six members from the 14 operators currently active in the region. The experience of this platform and learning generated through its creation can help to inform the establishment of a cross-sectoral platform in Guinea Forestière (see FFI case study prepared by Barry et al., 2021 for more information).

Nature-based solutions to drive positive outcomes in the landscape

Delivering on corporate commitments

Industry can play a pivotal role in helping to secure identified conservation priorities, addressing gaps in information, and make a positive contribution towards landscape and local objectives, whilst delivering on respective company commitments and business needs.

Ecosystem-based approaches to mitigating and managing environmental impacts of development provide an essential means of applying the mitigation hierarchy and focusing investments in a landscape. Such nature-based solutions (NbS) involve 'actions to protect, sustainably manage and restore natural or modified ecosystems to address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits' (Cohen-Shacham et al., 2016).

NbS approaches represent an important, yet significantly underutilised, opportunity for industry actors to meet their respective corporate, legal and finance commitments to mitigate and manage impacts on biodiversity, water and climate, secure the social license to operate, whilst also contributing towards landscape and/or national sustainability targets (Box 10).

BOX 10: NATURE-BASED SOLUTIONS TO MITIGATE DEVELOPMENT IMPACTS ON BIODIVERSITY, CLIMATE AND SOCIETY

In response to increasing pressure by investors and other stakeholders, large-scale mining companies are improving commitments and reporting on environmental, social and governance (ESG), but there is still a long way to go. Commitments on emission reductions of up to 30% still fall way short of the 40-70% reductions needed to meet the Paris Agreement goal of 2 degrees.³⁰ Less than a quarter of mining companies have publicly engaged in any form of climate scenario analysis. Furthermore, there remains a significant disjuncture between public commitments at the top and tangible actions on the ground.³¹ Many impacts, such as indirect impacts on land use, forest loss and degradation, do not feature in many company climate policies or emissions reporting and those that do are often approached in an isolated, siloed manner.

Recognition and application of NbS in the mining sector is very low. Despite many mining projects actively being involved in a range of land restoration activities that could be adapted to NbS, relatively very little has been done to tie such investments into the achievement of sustainability targets. But this means that the potential for NbS in mining is high. This is particularly true for mining projects in forest landscapes such as Guinea Forestière. This is both where some of the most significant, and visible, environmental and social implications of mining lie, but also the greatest potential for NbS to mitigate the harmful impacts. Guidance is under development that will help make the case for *why* NbS should be more widely used as part of large scale mining projects, particularly in forest landscapes, what the options for NbS are, how mining projects can select and finance appropriate solutions, how investors and regulators can facilitate uptake, and what the commercial issues to be aware of are.

³⁰ Climate risk and decarbonization: What every mining CEO needs to know (2020) McKinsey & Company.

³¹ Responsible Mining Foundation (2020) Responsible Mining Initiative Report.

NbS examples **relevant to the landscape** include:

- securing protection of forest habitat and its associated biodiversity, water regulation and carbon sequestration values through REDD+ or biodiversity offsets
- responding to potential induced and cumulative effects by investing in ventures that generate sustainable livelihoods whilst deflecting pressure from sensitive forest habitat and species (Box 9)
- working with local communities to establish forest-based enterprises and inclusive green financing instruments
- establishing strategic partnerships between private sector, government, civil society organisations and local communities to realise opportunities for habitat restoration and enhancement to improve biodiversity and carbon values.

NbS to deliver biodiversity offsets

Biodiversity offsets and other forms of ecological compensation are examples of NbS that industry operators will be required by law to implement in Guinea to compensate for damages to natural ecosystems and species. Whilst the specific regulatory requirements are currently under development, this represents a significant step change in the policy environment, broadening requirements for biodiversity offsets beyond those operators seeking to fulfil voluntary best practise or to comply with conditions of international finance (e.g. IFC Performance Standards). With a **legal driver in place**, the critical role that industry operators in the Guinea Forestière can play in contributing towards securing conservation priorities in this landscape through offsetting or some form of ecological compensation must now be realised through tangible action on the ground.

For example, mining projects planned for the Simandou hills are expected to have significant impacts on rare, endemic and threatened species (including western chimpanzees, among many others) and ecosystems, including sub-montane forests. **Not all impacts can be compensated for** and in such sensitive and high biodiversity value sites the avoidance and minimisation of impacts is of paramount importance. However, projects will also need to consider offset options in the landscape. This could include, for example:

- investment in identified conservation priority sites such as the Ziama and Diecke forests (e.g. to generate sustainable conservation finance for their long-term management, to secure or upgrade legal protection, to support ecological restoration targeting degraded areas and those necessary for improving ecological integrity etc.)
- building partnerships and alliances to support interventions in areas outside of the conservation area network aimed at maintaining or improving functional connectivity (e.g. supporting ecosystem restoration through agroforestry; improving the productivity of existing or degraded agricultural lands to reduce further conversion of forests for cultivation).

Moving away from ad hoc project-by-project investments to the more coordinated investment and action in landscape priorities by multiple operators (e.g. through combining investment in nature-based solutions at strategic priority locations in the landscape) has the potential to consolidate and improve outcomes for biodiversity, communities, water security and climate mitigation at these locations.

There is already precedent for such an approach in Guinea and the wider transboundary landscape with private sector actors playing a pivotal role in securing the protection of priority conservation areas. This includes mining companies Guinée Alumina Corporation (GAC) and Compagnie des Bauxites de Guinée (CBG) that have together committed significant finance (to the total sum of \$48 million) to create the Moyen Bafing National Park (MBNP) and support chimpanzee conservation activities in the park, as part of their offset commitment for bauxite mining projects in the Boke region (Wild Chimpanzee Foundation (WCF) & Office Guinéen des Parcs et Reserves (OGuiPar), 2017; World Bank, 2019d). This represents the main budget dedicated to biodiversity in the country. Elsewhere, in Sierra Leone – the only country with long-standing legal

requirements for biodiversity offsetting – the Loma Mountains Non-Hunting Forest Reserve was identified as a key area in the national protected areas system and was declared a National Park in 2012 to offset the environmental impact caused by the creation of the Bumbuna dam on the Seli River (Garriga, 2019).

There are limits to mitigation opportunity in any landscape.

Just as there are **limits to the impacts on socioecological systems that can be sustained** whilst allowing the landscape and its constituent parts to adapt and continue to persist, thrive and be resilient, there will be **limits to mitigation opportunity in the landscape**. As more mineral concessions and permits for exploration and exploitation are issued, and the impacts of other sector operations and unregulated land uses continue to grow, the opportunities for companies to compensate for damages will diminish. The need for a coordinated landscape approach to biodiversity offsetting and ecological compensation is emphasised.

Biodiversity offsets are just one mechanism through which industry operators can deliver nature-based solutions that mitigate and manage environmental and social impacts whilst delivering on company commitments and business needs. REDD+ has proven an important mechanism in helping to driver the gazettement or upgrading of protected areas (e.g. in Liberia where progress is being made towards Wonegizi's gazettement) and to generate a source of sustainable finance for protected areas management (e.g. the Gola Rainforest National Park in Sierra Leone is set to be the country's first REDD+ project, selling carbon credits on the voluntary market, with the project designed to support biodiversity and ecosystem conservation and community development for 122 forest edge communities³²).

Whilst REDD+ is yet to be advanced in Guinea, the feasibility of developing REDD+ projects for the voluntary market warrants investigation, particularly as it may offer an opportunity for industry operations in Guinea Forestière to help secure climate financing for socially inclusive and sustainable projects that deliver carbon sequestration, sustainable livelihoods, and biodiversity conservation benefits.

The co-benefits of NbS

Whatever the mechanism established to enable industry investment in conservation and sustainable development objectives, the types of activities, collaborations and financing needed to achieve conservation impact will be specific to the socioecological context at each area (Heinicke et al., 2019b). **Landscape level assessments to help identify specific locations and actions that can deliver greatest conservation impact are needed** (see Box 11 for example) and must be coupled with an understanding of the social, economic, cultural and political context (as well as biophysical and ecological) and in collaboration national and landscape stakeholders (see also Section 4.2 and, for case study examples, see also World Bank, 2019d).

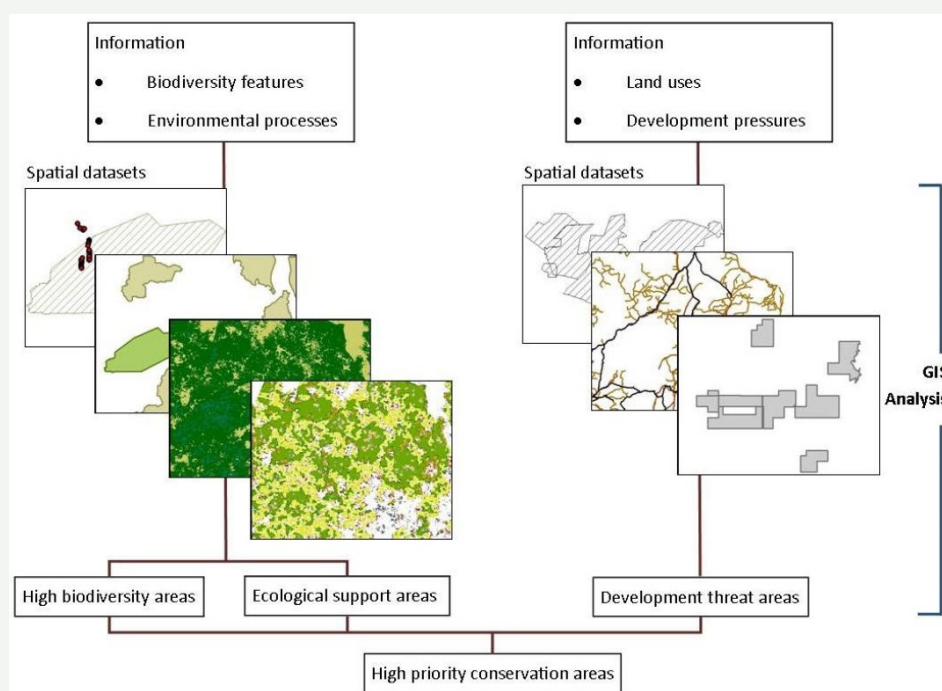
³² <https://gola.standfortrees.net/> and <https://golarainforest.org/our-work>

BOX 11: REFINING THE SYSTEMATIC PRIORITISATION OF CONSERVATION AREAS TO SUPPORT TARGETED ACTION AND INVESTMENT IN THE ZIAMA-WONEGIZI-WOLOGIZI FORESTS.

To support ongoing conservation planning, further refine prioritisation of areas important for conservation and to inform management action on the ground, a landscape level analysis was undertaken in collaboration with the Government of Liberia and project partners focusing on the transboundary forest complex that encompasses the Wonegizi and Wologizi Proposed Protected Areas in Liberia and the connected Massif du Zياما Biosphere Reserve in Guinea (FFI, 2020a).

The transboundary forest complex comprising the Massif du Zياما Biosphere Reserve in Guinea and the connected Wonegizi, Wologizi and Foya Proposed Protected Areas in Liberia has been identified as a high priority for the conservation of forest biodiversity. To further refine the prioritisation process within this forest complex, a landscape level assessment was conducted centred on Zياما and the connected forests of Wonegizi and Wologizi in order to systematically identify conservation priorities that might be compromised or lost to developments and other land uses.

This landscape level assessment combined biodiversity data on protected areas, species and extant habitat, with the documented and anticipated developments and other threats to biodiversity, to assess the potential conflicts and pressures across the landscape that might compromise biological and ecological integrity (see below). Different analyses were conducted on these layers, including deforestation risk models and structural and functional forest connectivity models.

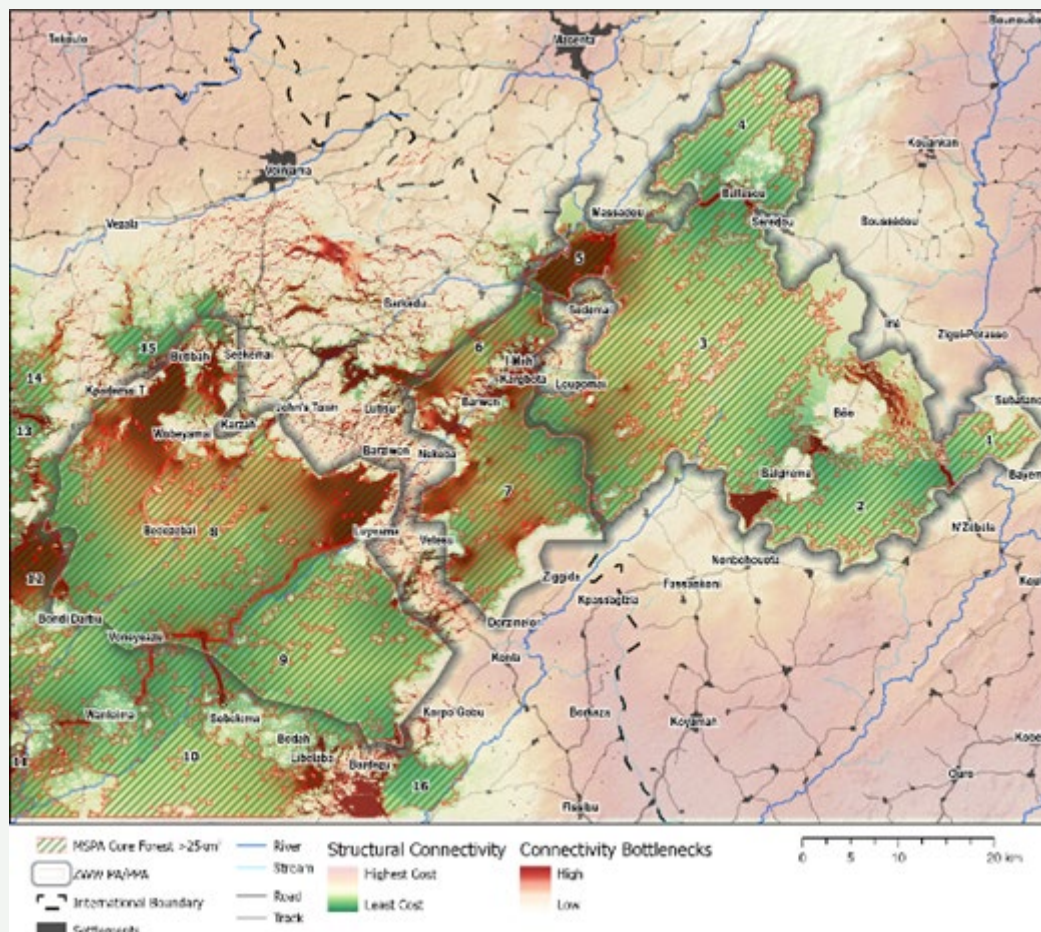


Overview of the systematic process of the landscape level assessment.

Landscape level analysis identified threats and strategic areas to target activities in collaboration with local authorities and communities to help maintain and improve forest connectivity and ecosystem functioning. For example, whilst the boundary of Zياما appears well maintained a deforestation risk analysis revealed 40% of Zياما to be at high or very high deforestation risk.

Analysis further highlighted that functional corridors are already crossing agricultural mosaics and further habitat degradation/encroachment in certain areas might narrow bottlenecks, isolating core forest areas and

reducing connectivity with forests across the border in Liberia (see below). The assessment identified areas where industry activity should be avoided but also identifies strategic conservation actions that could be enabled and supported by industry investment and sustainable financing mechanisms (see the full report FFI, 2020a for further details).



ZWW Structural Forest Connectivity Bottlenecks, 2019

Extending the Ziama-Wonegizi-Wologizi assessment in Guinea Forestière, through a cross-sectoral, stakeholder engaged and spatially explicit process, could help to provide a robust foundation from which strategic industry engagement and investment can be further developed.

5 RECOMMENDATIONS

Building on desk-based analyses, the landscape level assessment of the Ziama-Wonegizi-Wologizi forests, FFI's operating experience in Guinea Forestière, and initial stakeholder engagement, a number of recommendations are made to take the conceptual framework forward to application in this landscape.

1. Ensure alignment with new and emerging national policy and legislative frameworks designed to support the broad application of the mitigation hierarchy and explore opportunities for Framework application to support delivery of national and landscape objectives.
2. Understand customary tenure and decision-making, as well as constraints on land use choices at the local scale.
3. Convene landscape actors (national government, municipal authorities, traditional leaders, forest management agencies, industry operators, communities, NGOs and experts) and facilitate a cross-sectoral, multi-stakeholder and spatially explicit process to build a shared understanding of the landscape (current state, uses and values and threats (verifying, updating and extending desk-based information summarised in Section 2 of this report). This can help to establish a solid foundation on which to build a common vision and agenda for the landscape.
4. Address identified gaps in information and data. An expanded, stakeholder-engaged and spatially explicit landscape level assessment process is recommended making use wherever possible of latest methods (e.g. eDNA) and technologies (e.g. for remote sensing), expert input and local knowledge, and facilitates data sharing by land users. This will help to improve the evidence base on which decisions are made.
5. Establish sectoral and/or cross-sectoral platforms to foster improved communication and data sharing, to develop a shared understanding of the impacts of different land uses and how they may aggregate and interact to create cumulative effects, particularly when assessed in the context of other threats and pressures.
6. Catalyse, facilitate and support sectoral and cross-sectoral communication, coordination and collaboration to prevent, mitigate and manage induced and cumulative effects of current and planned future development (regulated and unregulated) on biodiversity and ecosystem services.
7. Raise awareness and build capacity to apply the mitigation hierarchy (or equivalent) to mitigate and manage adverse impacts at the project level across all sectors, including but not limited to those requiring an ESIA.
8. Further investigate and prioritise opportunities for industry operators to support sustainable conservation financing and contribute towards landscape conservation and restoration objectives whilst fulfilling their respective commitments to avoid, mitigate and manage project level impacts (e.g. through biodiversity offsets, REDD+, sustainable livelihoods programmes etc).
9. Identify opportunities and risks for ecosystem restoration in the landscape to maintain or improve functional connectivity, building on the Forest Landscapes Restoration approach and related methodologies and guidance.
10. Support the formation of landscape partnerships to deliver conservation and restoration action.
11. Continue and expand ongoing work in the landscape to support and enable smallholder farmer uptake of more sustainable practises to reduce the detrimental effects of small-scale agriculture on the environment.

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DATA SOURCES

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Conservation Areas	All nationally declared and legally protected or internationally recognised conservation areas, including National Parks, Classified Forest Reserves, Wildlife Management Areas, Faunal Reserves, Nature Reserves, Hunting Areas and Reserves, Ramsar Wetlands of International Importance, World Heritage Sites and UNESCO Man and Biosphere Reserves. Proposed Protected Areas in Liberia have been accessed through the Forestry Development Authority.	World Database on Protected Areas (WDPA), Forest Development Authority Liberia (FDA)	<p>UNEP-WCMC and IUCN (2020), Protected Planet: The World Database on Protected Areas (WDPA) [On-line], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.</p> <p>Liberia Forest Atlas (2019). Dynamic forest monitoring system for Liberia's forest sector: Protected Areas. [ONLINE]. https://lbr.forest-atlas.org/.</p>	<p>https://www.protectedplanet.net/</p> <p>http://lbr-data.forest-atlas.org/</p>
Key Biodiversity Areas	Sites of global importance to the planet's overall health and the persistence of biodiversity, either coinciding with declared conservation areas or external to the protected area network and supported by the Key Biodiversity Areas Partnership.	Key Biodiversity Areas Partnership	Key Biodiversity Areas Partnership (2020). 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, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society.	http://www.keybiodiversityareas.org/
Land cover	Classified land cover representing the year 2016 at 20m resolution based on 1 year of Sentinel-2A imagery from December 2015 to December 2016. The following land cover classes describe the land surface across the African continent: "trees cover areas", "shrubs cover areas", "grassland", "cropland", "vegetation aquatic or regularly flooded", "lichen and mosses / sparse vegetation", "bare areas", "built up areas", "snow and/or ice" and "open water". In this project's application, this layer has been correlated with the Global Forest Watch forest cover and forest loss layers to update the land cover to the current year 2020.	European Space Agency (ESA)	European Space Agency Climate Change Initiative (2016) "S2 Prototype Land Cover 20m Map of Africa 2016". European Space Agency.	http://2016africallandcover20m.esrin.esa.int/

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Tree coverage	Global measure of tree cover percentage at approximately 30 × 30 metre resolution and derived from Landsat imagery for the periods 2000 and 2010. Tree cover is defined as all vegetation greater than 5 meters in height and may take the form of natural forests or plantations across a range of canopy densities.	Hansen/University of Maryland (UMD)/Google/United States Geological Survey (USGS)/National Aeronautics and Space Administration (NASA), accessed through Global Forest Watch	Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. <i>Science</i> 342: 850–53.	https://glad.umd.edu/dataset/global-2010-tree-cover-30-m
Tree height	Global measure of tree canopy maximum height (in metres) at approximately 30 x 30 metre resolution using lidar forest structure measurements and Landsat imagery for the year 2019.	Hansen/University of Maryland (UMD)/National Aeronautics and Space Administration (NASA), accessed through Google Earth Engine	P. Potapov, X. Li, A. Hernandez-Serna, A. Tyukavina, M.C. Hansen, A. Kommareddy, A. Pickens, S. Turubanova, H. Tang, C.E. Silva, J. Armston, R. Dubayah, J. B. Blair, M. Hofton (2020) Mapping and monitoring global forest canopy height through integration of GEDI and Landsat data. <i>Remote Sensing of Environment</i> , 112165.	https://glad.umd.edu/dataset/gedi
Habitat function	To perform habitat function connectivity analysis on the land cover layer, Morphological Spatial Pattern Analysis was utilised. Using the connectivity classes of core habitat, edge habitat and bridge habitat, the tool assesses the shape, size and distance of habitat patches using simple mathematical operators. All land cover classes of forest and flooded vegetation were integrated in the habitat layer to which the connectivity was performed.	Joint Research Centre (JRC)	Ostapowicz, K., Vogt, P., Riitters, K. H., Kozak, J. & Estreguil, C. (2008). Impact of scale on morphological spatial pattern of forest. <i>Landscape Ecology</i> , 23:1107–1117.	https://forest.jrc.ec.europa.eu/en/activities/lpa/mspa/

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Forest loss	Global measures of tree cover loss at approximately 30 × 30 metre resolution and derived from yearly composites of Landsat imagery. Tree cover loss is defined as “stand replacement disturbance,” or the complete removal of tree cover canopy at the Landsat pixel scale. Tree cover loss may be the result of human activities, including forestry practices such as timber harvesting or deforestation, as well as natural causes such as disease, storm damage or fire.	Hansen/University of Maryland (UMD)/Google/United States Geological Survey (USGS)/National Aeronautics and Space Administration (NASA), accessible via Global Forest Watch	Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. <i>Science</i> 342: 850–53.	http://earthenginepartners.appspot.com/science-2013-global-forest
Great ape population density: western chimpanzee	Modelled estimated population density values per square kilometre for Western chimpanzee across its geographic range. Various spatial variables were utilised in the modelling of population densities, including predictor variables derived from site-specific surveys, habitat variables, environmental gradients and anthropogenic and vulnerability variables.	Heinicke <i>et al.</i> (2019)	Heinicke, S., Mundry, R., Boesch, C., Amarasekaran, B., Barrie, A., Brncic, T., ... Kühl, H. S. (2019). Advancing conservation planning for western chimpanzees using IUCN SSC A.P.E.S.—the case of a taxon-specific database. <i>Environmental Research Letters</i> , 14(6), 064001.	https://doi.org/10.1088/1748-9326/ab1379
Habitat suitability	Modelled habitat suitability for Western chimpanzee, African forest elephant and pygmy hippopotamus within the Upper Guinea lowland rainforest extent of West Africa. Derived from analysis using Maxent models and predictor variables of a combination of georeferenced species occurrence data and environmental data, including climatic variables, vegetation and habitat types and precipitation.	Freeman <i>et al.</i> (2019)	Freeman, B., Roehrdanz, P. R., & Peterson, A. T. (2019). Modeling endangered mammal species distributions and forest connectivity across the humid Upper Guinea lowland rainforest of West Africa. <i>Biodiversity and Conservation</i> , 28(3), 671–685.	https://doi.org/10.1007/s10531-018-01684-6

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Suitable corridors for connectivity	Modelled suitable corridors for Western chimpanzee, African forest elephant and pygmy hippopotamus within the Sapo-Tain and Gola-Ziama forest complexes in West Africa. The least-cost path routes between the established and proposed protected areas within the focal areas were derived from modelling species' dispersal variables and habitat suitability using Circuitscape, Linkage Mapper and Pinchpoint Mapper.	Freeman <i>et al.</i> (2019)	Freeman, B., Roehrdanz, P. R., & Peterson, A. T. (2019). Modeling endangered mammal species distributions and forest connectivity across the humid Upper Guinea lowland rainforest of West Africa. <i>Biodiversity and Conservation</i> , 28(3), 671–685.	https://doi.org/10.1007/s10531-018-01684-6
Granted mining claims	Global mining concession dataset, based on the ground covered by a polygon that has been set aside for an activity to take place. This activity could be mining exploration and/or extraction. The dataset utilised in this project is the publically available version, where no interrogation of the data is possible.	SNL Metals & Mining	SNL Metals & Mining, an offering of S&P Global Market Intelligence (2020)	https://panda.maps.arcgis.com/home/item.html?id=6f8e17219c354878af009a6cc9a9f571
Awarded oil and gas concessions	Global oil and gas concession dataset on the location, type, dates and participating companies for all the oil & gas licensed acreage. It also includes applications and some open acreage where country grids defined. The dataset utilised in this project is the publically available version, where no interrogation of the data is possible.	Drilling Info	Copyright Drilling Info, Inc. (2020)	https://panda.maps.arcgis.com/home/item.html?id=2eba17ff88924fa0b08a5c360442ec59
Forestry licenses	Polygons representing the extent of known and active forestry licenses derived from a variety of sources within each of the focal countries.	Liberia: AidData	Bunte, Jonas B., Harsh Desai, Kanio Gbala, Brad Parks, Daniel Miller Runfolo. 2017. Natural Resource Sector FDI and Growth in Post-Conflict Settings: Subnational Evidence from Liberia. AidData Working Paper #34. Williamsburg, VA: AidData. "Managed forest concessions." Accessed through Global Forest Watch (2020)	https://www.aiddata.org/data/liberia-concessions-geocoded-research-release-level-1-v-1-0 https://www.globalforestwatch.org

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Community forests	Communal Forests are areas set aside by statute or regulation for the sustainable use of forest products by local communities or tribes on a non-commercial basis in Liberia. According to the National Forestry Reform Law of 2006, no prospecting, mining, settlement, farming or commercial timber extraction is permitted on community forests.	Liberia: AidData	Bunte, Jonas B., Harsh Desai, Kanio Gbala, Brad Parks, Daniel Miller Runfolo. 2017. Natural Resource Sector FDI and Growth in Post-Conflict Settings: Subnational Evidence from Liberia. AidData Working Paper #34. Williamsburg, VA: AidData.	https://www.aiddata.org/data/liberia-concessions-geocoded-research-release-level-1-v-1-0
Private Use Permits	Private Use Permit refers to a type of framework agreement in Liberia, established in 2006, allowing private individuals to sign contracts with companies for extractive activities. They are approved by the Forest Development Authority. This data set was compiled by AidData who collected the information from Global Witness and the Sustainable Development Institute.	AidData	Bunte, Jonas B., Harsh Desai, Kanio Gbala, Brad Parks, Daniel Miller Runfolo. 2017. Natural Resource Sector FDI and Growth in Post-Conflict Settings: Subnational Evidence from Liberia. AidData Working Paper #34. Williamsburg, VA: AidData.	https://www.aiddata.org/data/liberia-concessions-geocoded-research-release-level-1-v-1-0
Oil palm concessions	Displays boundaries of areas of known oil palm plantations for Liberia, compiled by Global Witness from available government maps. Information provided with this data set includes company, ownership group, and land area.	Global Witness	"Oil palm concessions." Accessed through Global Forest Watch	https://www.globalforestwatch.org
RSPO oil palm concessions	This data layer displays the concession boundaries of Roundtable on Sustainable Palm Oil (RSPO) member companies current to the year end 2020, including both certified and non-certified concessions, as well as concessions where the certification status is unknown. The concession boundaries were provided to the RSPO by member companies.	Roundtable on Sustainable Palm Oil (RSPO) Member Companies	RSPO (2020) RSPO Concession. Spatial dataset available from GeorSPO.	https://rspo.org/members/georspo

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Human modification gradient	The global Human Modification map provides a cumulative measure of human modification of terrestrial lands across the globe for the year 2016 at a 1-km resolution. It is a continuous 0-1 metric that reflects the proportion of a landscape modified based on modelling the physical extents of 13 anthropogenic stressors and their estimated impacts using spatially-explicit global datasets with a median year of 2016.	Kennedy <i>et al.</i> (2019)	Kennedy, C. .M, Oakleaf, J. R., Theobald, D. M., Baruch-Mordo, S., Kiesecker, J. (2019) Managing the middle: A shift in conservation priorities based on the global human modification gradient. <i>Glob Change Biol.</i> 25:811–826.	https://doi.org/10.1111/gcb.14549
Aboveground biomass	Modelled terrestrial aboveground live woody biomass density (megagrams biomass ha ⁻¹) at approximately 30-meter resolution for the year 2000, expanding on the methodology presented in Baccini <i>et al.</i> (2012). The data are AGB density values (megagrams biomass/hectare), where aboveground carbon density values can be estimated as 50 percent of biomass density values.	Woods Hole Research Center, Zarin	Woods Hole Research Center. Unpublished data. Accessed through Global Forest Watch Climate	https://www.climate.globalforestwatch.org
Population density	Modelled estimates of the total number of people per square grid across continental Africa, with national totals adjusted to match UN population division estimates and revised to depict year 2012.	WorldPop	United Nations (2015) 'World Population Prospects'	http://esa.un.org/wpp/
Administrative borders	Global administrative data of the international country boundaries and regional boundaries of Guinea, Liberia, and Sierra Leone.	Global Administrative Areas (GADM)	Global Administrative Areas (2019). GADM database of Global Administrative Areas, version 2.0. [ONLINE] URL: www.gadm.org .	https://gadm.org/
Road network	The Global Roads Inventory Project (GRIP) dataset was developed to provide a more recent and consistent global roads dataset, consisting of global and regional vector datasets in ESRI file geodatabase and shapefile format and derived from a variety of sources including OpenStreetMap.	Global Roads Inventory Project (GRIP) 4	Meijer, J.R., Huijbeugs, M.A.J., Schotten, C.G.J. and Schipper, A.M. (2018) Global patterns of current and future road infrastructure. <i>Environmental Research Letters</i> , 13-064006.	www.globio.info

DATA LAYER	DESCRIPTION	SOURCE	REFERENCE	LINK TO DATA
Railway network	The railway key is a label from OpenStreetMap which aims to map and document all types of railways including light rail, mainline railways, metros, monorails and trams.	Open Street Map	Open Street Map. "Key: Railway".	https://wiki.openstreetmap.org/wiki/Planet.osm
Satellite imagery	Imagery of terrain based on various years and imagery sources	Esri, DigitalGlobe, GeoEye, i-cubed, United State Department of Agriculture and Food and Drug Administration (USFDA), Farm Service Agency (FSA), United States Geological Survey (USGS), Aerials Express (AEX), Getmapping, Aerogrid, Institut national de l'information géographique et forestière (IGN), Portuguese Geographic Institute (IGP), swisstopo, and the GIS User Community	Various sources and dates, World Imagery. ESRI.	https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9

**Coordinated and
collaborative application
of the mitigation hierarchy
in complex multi-use
landscapes in Africa:
Upper Guinean Forest
Transboundary Landscape**