



EXTRACTIVE INDUSTRIES AND PROTECTED AREAS IN CENTRAL AFRICA: FOR BETTER OR FOR WORSE?

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The countries of Central Africa are distinguished by the abundance of both their biodiversity and natural resources, particularly minerals, gas and oil. This dual wealth could offer extraordinary opportunities for development if it is governed wisely and revenues are shared equitably (Maréchal, 2013). The economic growth and emergence plans drawn up by the States rely mainly on the exploitation of mineral resources. While mining and oil industries can be sources of employment (albeit generally modest) and wealth, they also can cause substantial environmental and socioeconomic damage (Carbonnier, 2013; Maréchal, 2013; Noiraud *et al.*, 2017; Chuhan-Pole *et al.*, 2020). However, this damage can be mitigated, and there also are potential opportunities for investments in biodiversity protection.

Countries in the subregion grew by an average of 5.8% between 2001-2012, compared to 3.0% between 1990-2000, enabling Central Africa to record the second highest growth rate in Africa over this period (BAD, 2013). This performance generated a surge of optimism regarding their economic development prospects. Unfortunately, the anticipated upturn was short-lived, with growth rates dropping to 1.1% in 2017, rising slightly to 2.2% in 2018 (BAD, 2019), only to be followed by the crisis induced by the Covid-19 pandemic that began in early 2020 (BAD, 2020). This weak performance is largely due to limited local processing capacities for raw materials, which are mostly exported unprocessed, thereby reducing the value added of these products. Similarly, fluctuations in the price of raw materials on the international market contribute to the vulnerability of economies based on the export of these raw materials, including minerals. Most of the major mining projects, particularly iron ore exploitation, also have not yet materialized due to the fall in ore prices on the international market, a phenomenon linked to increased iron production in other regions of the world.

At the same time, Central African countries shelter important and, in many ways, unique biodiversity (Billand, 2012; Maréchal *et al.*, 2014; Doumenge *et al.*, 2015). This biodiversity takes a considerable part in national economies. For example, the forests of the Congo Basin contribute 18% of GDP in the Central African Republic (CAR) and 20% of foreign exchange earnings in Cameroon (Tieguhong & Ndoye, 2007). To ensure the *in situ* protection of this biodiversity, numerous protected areas were created,

over which diverse and often antagonistic economic interests are now competing.

Protected areas contain not only a wealth of biodiversity, but also subsoil that can be important reservoirs of mineral resources (minerals, oil, and gas). These resources are coveted by multinational firms as well as small-scale prospectors. In Gabon, for example, the Gamba Complex of Protected Areas contains a wide diversity of habitats and species as well as the country's largest onshore oil reserves (Dallmeier *et al.*, 2006). Oil reserves also have been found in other protected areas, including Virunga National Park and Salonga National Park in the Democratic Republic of the Congo (DRC), two of the most important protected areas in Central Africa. Virunga hosts the richest biodiversity of all the protected areas in the subregion (Plumptre *et al.*, 2017), while Salonga is the largest forest park in Africa and one of the very first in the world.

In Cameroon – but this holds true in other countries as well – national strategies for the management of mining and forest resources show that sector-specific laws contain clear contradictions regarding forest land use (Schwartz *et al.*, 2012). Overlapping industrial mining claims, forest titles, and protected areas are common throughout Central Africa (Doumenge *et al.*, 2016; Noiraud *et al.*, 2017). Artisanal mining, such as gold panning and diamond mining, also is widespread throughout the subregion and occurs extensively in protected areas. While this activity is a source of income for local communities, it has significant impacts on forest cover and poses a threat to conservation (Messina & Feintrenie, 2014).

The activities of extractive industries are, a priori, incompatible with the conservation objectives assigned to protected areas. To exploit subsurface resources, the topsoil and all that it contains must be stripped away. Furthermore, the transportation of mineral commodities requires transportation infrastructure to be constructed, which also drives deforestation, forest fragmentation, land degradation and biodiversity loss. In light of the economic importance of extractive industries, but also the commitments made by States to protect biodiversity (as a global public good, to benefit from a healthy environment and to support their economic activities; Aveling, 2009), how can the socioeconomic imperatives facing governments be reconciled with environmental considerations? In other words, to what extent can the exploitation of mineral resources be combined with the vital need to safeguard the environment and society?

This is the core issue addressed by this chapter, and one which also involves the following questions:

- what is the current situation of oil and mining extractive industries in Central Africa?

- how and to what extent do they impact protected areas and natural ecosystems?
- how can a harmonious and mutually beneficial cohabitation be ensured between, on the one hand, the conservation of natural environments and their biodiversity and, on the other, the exploitation of mining resources, in the broadest sense of the term (minerals, oil and gas)?

1. Extractive industries, development and conservation

The mining, gas and oil potential of African countries in general, and those of Central Africa in particular, is very rich and varied (oil, copper, manganese, iron, diamond, cobalt, coltan, etc.). Mining in the subregion is benefiting from favorable conditions, notably the sustained rise in the prices of certain minerals and an explosion in demand from China, India and other emerging economies driven by their rapid growth.

Environmental impacts

Industries generate environmental and socioeconomic impacts that need to be characterized and managed. In terms of environmental impacts, one can distinguish:

- **direct impacts**, caused by the extraction activity and which occur at the same time and in the same place (degradation of plant cover, soil and groundwater pollution, etc., on the operating site);
- **indirect impacts**, caused by the extraction activity but which occur later or further away from the site (long distance pollution of the water table or atmosphere, decline in human health, dwindling wildlife, etc.). These impacts are nevertheless reasonably predictable;
- **cumulative impacts**, which result from the incremental impact of the extraction activity on top of past or present activities. They also are reasonably predictable;
- **major changes** in local economies, culture, infrastructure use, employment, or human migration that may be generated by extraction and transportation activities and which are more difficult to characterize and quantify. In particular, mining projects attract traders and a range of hunters and small-scale farmers and fuelwood producers, drawn by the increased availability of cash and opportunities arising from the food and fuelwood needs of the people living around the mine.

The exploration and extraction of oil, gas and minerals involve high levels of uncertainty with regard to the resources hidden below the ground, heavy initial investments and long exploration and project development phases. Extraction activities also require specialized techniques and significant investments. Consequently, the sector is dominated by large multinational companies with vertically integrated value chains. It is characterized by high profits that fluctuate according to international market prices and extraction costs.

Given the importance of the sector to the continent, in 2009 the African Union adopted a general framework for the development of mining resources called the Africa Mining Vision (AMV), complemented in 2011 by an action plan (Union Africaine *et al.*, 2011). AMV recommends improving the conditions for negotiating mining contracts, paying more attention to the environment, and ensuring the best use of natural resources and the development of African skills. Unfortunately, the implementation of AMV at the national level has been slow to materialize. AMV remains insufficiently understood by governments, as well as the private sector and civil society, even though this action framework promotes the creation of local value and the fight against tax evasion (Ushie, 2017).

In contrast, an analysis of recently initiated reforms of mining codes in Central African countries indicates that the codes are oriented toward intensifying mining and oil exploration, reducing administrative procedures, increasing tax incentives and increasing the share of revenue going to the government. This approach neglects or slightly downplays the question of the impact of mining operations on the environment, as well as on the income and well-being of local communities and residents.

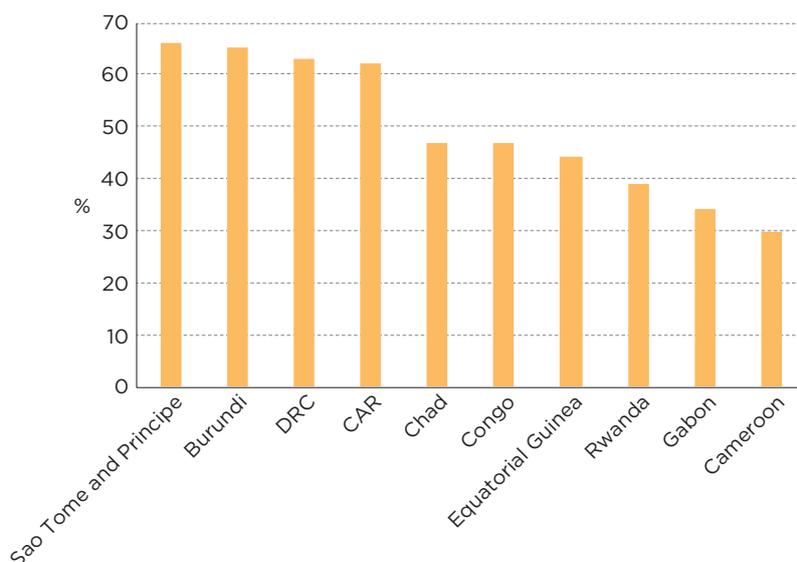
C. Rosellini emphasized as early as 2005 (p. 137), “The main issue for the oil-producing countries in Central Africa is the maximization of their oil resources for the development and well-being of the population”. While some countries are able to make better use of their natural resource endowment, others have mediocre growth rates, despite their abundant underground wealth. The economies of Gabon, Congo, Equatorial Guinea, and DRC are largely based on extractive resources (85 to 95% of exports by value: OEC, 2020). While the top three have higher GDP per capita than other Central African countries (Figure 1), they do not always rank better than their neighbors in terms of poverty rates or the Inequality-adjusted Human Development Index (IHDI; Atlasocio, 2020a and b; Index Mundi, 2020e). DRC’s economy is



based largely on mining, but the country is one of the poorest in the world. Revenues from mineral resources frequently widen the gap between rich and poor (Noiraud *et al.*, 2017). This is what some authors have called the “curse of natural resources” (Sachs & Warner, 1995). In contrast, Cameroon, whose economy is not very dependent on mining or

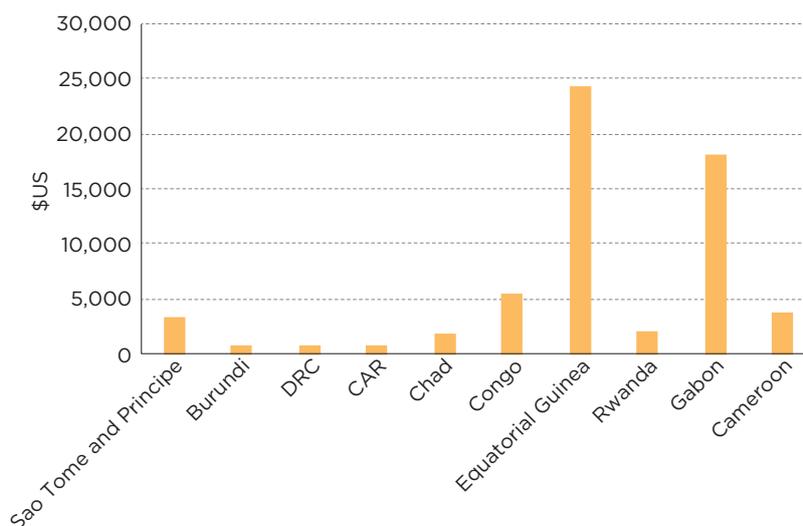
oil, and whose GDP per capita is lower than those of the three countries mentioned above, nevertheless has the lowest proportion of people living below the poverty line in the subregion. This is likely due to the greater diversification of its economy, a better distribution of national wealth and higher reinvestment in the country.

Figure 1 - Poverty and economic wealth in Central Africa



a) Percentage of total population below the national poverty line (2020)

Note: Of the 184 countries ranked, those in Central Africa are all among the 50 countries with the highest proportion of poor people in the world, including four in the top ten (Sao Tome and Principe, Burundi, DRC, CAR). Source: Index Mundi (2020e).



b) GDP/capita at purchasing power parity in current US\$ (2017)

Note: Of the 197 countries ranked, CAR, Burundi and DRC are ranked 197, 196 and 195 respectively. Most of the countries in the subregion are among the 50 countries with the lowest GDP per capita in the world, except for Equatorial Guinea, Gabon and Congo. Source: Atlasocio (2020a).

Other authors contest the existence of this so-called “universal curse” of natural resources (Alexeev & Conrad, 2009; Brunnschweiler & Bulte, 2008; Davis & Tilton, 2005). A more detailed analysis of the phenomenon reveals certain factors, in particular historical, institutional and resource concentration (large deposits with high potential added value), which may or may not sustain this paradox of national wealth alongside substantial poverty (Philippot, 2009; Carbonnier, 2013; Tcheta-Bamba & Kodila-Tedika, 2018). The fact remains that many Central African countries, despite their extensive natural resources and surges in growth when oil and mineral prices rise, have not been able to convert their underground wealth into harmonious and sustainable development for their people.

The main causes are inadequate legislative and institutional frameworks, weak and poorly enforced environmental and social standards, a lack of transparency and governance principles, and a still incipient freedom of expression and debate. An additional factor is a propensity to favor very large mining projects over smaller ones (Hilson, 2019). Under these conditions, mineral resources cease to be a godsend and become a curse. Mineral exploitation can generate different types of negative externalities, including struggles to capture resource rents and political instability, rising costs of living, social dislocation, environmental pollution, pressure on other limited natural resources, and so on (Carbonnier, 2013; Noiraud *et al.*, 2017; Chuhan-Pole *et al.*, 2020).

Nonetheless, some twenty African countries have adopted the Extractive Industries Transparency Initiative (EITI) standards. This initiative aims to promote more inclusive, transparent and accountable management of mineral resources by improving governance systems, making information about mining and drilling available to the public and building greater trust among stakeholders. Although many improvements are still needed, EITI has led to some progress in transparency in the sector in Central Africa (Cameroon, Congo, DRC, Chad; ITIE, 2020a). The organization has praised Congo’s recent progress in implementing the EITI standard for oil activities, including the establishment of an oil and gas cadastre system available on the internet (ITIE, 2020b; Ministère des Hydrocarbure, 2021).

Current mining codes incorporate environmental protection requirements by requiring prior environmental and social impact studies, as well as environmental and social management plans designed to mitigate and potentially repair the harmful effects of extractive industries. This is the case of Gabon, which revised its mining code extensively in 2019. Although it is considered to be more favorable to investors, it requires mining and oil companies to carry out an impact study approved by the two ministries concerned (the Ministry of Environmental Protection and Natural Resources, Forestry and the Sea and the Ministry of Mines and Industry) before any exploration or exploitation operation. The code also has instituted the requirement to contribute



1-5% of revenues to two funds to finance Corporate Social Responsibility (CSR) projects: the Industrial Responsibility Fund and the Social Responsibility Fund (DGT, 2020a).

One also should note that a number of financial institutions impose ecological requirements for the projects that they finance which go beyond national legal requirements (Equator Principles, International Finance Corporation (IFC) performance standards, etc.). When applied correctly, these requirements can reduce the ecological impact of mining projects. Certain standards emphasize the “no net loss of biodiversity” target. This requires biodiversity offsets but does not sufficiently take into account indirect and cumulative impacts of mining (which are often more significant than direct impacts).

Within the framework of these laws and standards, measures to avoid, reduce and offset impacts must be put in place to ensure that extractive activities are compatible with nature conservation requirements. At the political and institutional level, governments must ensure good cooperation and coordination between various public services (for example, the ministries in charge of mines, forests, the environment or agriculture). They also must build an operational synergy between government services, the private sector and any other stakeholder (in particular associations and Non Governmental Organizations - NGOs). For their part, extractive industry operators must implement the best operational practices compatible with the protection of nature and biological diversity.

Avoid - Reduce - Offset

Adapted from: Alligand *et al.* (2018)

In order to ensure that all activities and projects, whether these involve mining or, for example, infrastructure, are consistent with sustainable development principles and with the objective of causing no net loss of biodiversity, project holders and industrialists must implement the ‘avoid-reduce-offset’ sequence of actions.

1. Avoid: this consists of modifying a particular project or activity to remove a negative impact that the project or activity could generate. When the impacts are too great and the activity incompatible with sustainable development principles, the project may be cancelled.

2. Reduce: this consists of reducing a project’s negative impacts on the environment, whether these impacts are permanent or temporary, take place in the present or future, or occur in exploration, installation or operational phases. Reduction measures can achieve several outcomes; they can reduce the impact’s duration, intensity, scope, or a combination of these.

3. Offset: this consists of compensating for any significant direct or indirect negative effects generated by a project that could not be avoided or sufficiently reduced. Compensation measures must make it possible to preserve and, if possible, improve the quality of an environment. They include measures to restore degraded sites and compensate for residual damage to ensure, at a minimum, that there is no net loss of biodiversity. If possible, a net gain in biodiversity should be sought.

The order of the sequence also reflects a hierarchy: avoid > reduce > offset. Avoidance is the only action able to guarantee that an environment is not degraded; it must be promoted and applied from the earliest stages of project preparation, and can lead to the cancellation of a project. Impact reduction measures then should be implemented over the entire duration of a project. Offsetting, on the other hand, should only be used as a last resort, when all impacts that could not be avoided or sufficiently reduced must be remedied.

Despite some advances, progress in this area remains too sluggish (Noiraud *et al.*, 2017; Ushie, 2017). Governments and private companies are delaying changes in their practices and civil society is struggling to make its voice heard. In Central Africa, mining and oil exploitation is not yet an engine for sustainable development.

Some mining claims – for exploration and exploitation – are located on the outskirts of protected areas or encroach on their boundaries. They simultaneously represent a major source of multiple threats to the environment and a powerful lever for socioeconomic development. The risks and impacts of extractive industries on a protected area are linked to the relative location of the extractive activity, namely within the protected area or on its outskirts.

When extractive industries set up near protected areas, they generate many environmental and social impacts directly related to extraction and transportation activities (deforestation, soil degradation, pollution, etc.; Noiraud *et al.*, 2017). Indirect impacts also develop due to a significant influx of job seekers and their families and people attracted by the increased cash flows circulating around the mines. This invariably leads to increased poaching and cutting of wood for construction timber and charcoal production, as well as an extension of areas used for agriculture (Noiraud *et al.*, 2017; Voundi *et al.*, 2019).

The most drastic impact is related to the direct degradation or even downgrading of protected areas due to an overlap with exploration or mining claims (Qin *et al.*, 2019). In all countries of the subregion, the ministries in charge of mines and energy and the mining companies – which are multi-million-dollar enterprises – have much greater clout in negotiations than the ministries responsible for the environment and protected areas, not to mention civil society. In addition, struggles over power and turf between departments lead to anarchic and uncoordinated decision-making between the various ministries. To be convinced of this, one need only listen to a former DRC Minister of Mines, who stated loudly and clearly, “The law allows us to explore in any part of the country” (De Souza, 2019). This translates into decisions to overlap land uses that can lead to land use conflicts, usually to the detriment of local actors and ecological balances (Doumenge *et al.*, 2016; Noiraud *et al.*, 2017).

When governments must make a decision, this falls most often in favor of mining and oil extraction rather than protecting biodiversity and the provision of ecosystem services, even for protected areas listed as World Heritage sites (Qin *et al.*, 2019). In some cases, biodiversity is damaged, or a protected area loses part of its territory; in other cases, the protected area is simply downgraded outright (Rabanal *et al.*, 2010; Edwards *et al.*, 2014).

Against a backdrop of neoliberal capitalism, biodiversity conservation often is considered subordinate to its exploitation, and biodiversity conservation is not considered to be a sustainable development pillar on par with the economic and social pillars (MacKenzie *et al.*, 2017). While a shift in the balance has been initiated through mechanisms such as AMV, EITI standards and the Equator Principles, this remains insufficient. Incoherent public policies, a lack of transparency and corruption often favor opaque decision-making by the departments in charge of mines and energy.

In a country like DRC, the industrial mining sector has become slightly more transparent with, in particular, the introduction of a mining cadastre system accessible on the internet (Cadastre minier, 2020), but the oil sector remains very opaque. This is demonstrated by the pressures on Salonga and Virunga National Parks (Mupfuni & Malungu, 2018; De Souza, 2019; Qin *et al.*, 2019). The case of Virunga National Park is a good illustration. In the late 2000s, the Congolese government awarded production-sharing contracts to oil companies (Total, Soco), covering a large part of the park’s area. After intense campaigning by national and international NGOs and organizations such as UNESCO (United Nations Educational, Scientific and Cultural Organization), Total rapidly withdrew from the project, and Soco eventually announced that it would stop operations in June 2014. However, it recently was reported that the Congolese government signed a tentative agreement to reallocate Soco’s license to another oil company.

Case studies like that of Virunga Park show that international extractive companies and governments can be influenced by NGO campaigns and pressure from international bodies (such as the World Bank or UNESCO). However, in the absence of transparent



and coherent multisectoral policies, the actors with the least amount of financial and human capital, and the economic sectors which are the weakest, remain under intense pressure from private political and financial interests. Against this backdrop, protected areas continue to be subjected to strong recurring pressures, even when they are critically important to national networks, both in terms of biodiversity protection and ecosystem services provided to human populations (Qin *et al.*, 2019).

Nevertheless, it has sometimes been possible to achieve a balance, at least in part, between oil exploitation, local development and conservation. In particular, the identification of key elements of biodiversity and the implementation of monitoring systems make it possible to minimize certain impacts of exploitation operations. This is the case with Shell Gabon's oil operations from the 1960s until 2017 in the Gamba Complex of Protected Areas (Dallmeier *et al.*, 2006). With support from organizations such as the Smithsonian Institution, Shell developed a biodiversity action plan that identified particularly important or vulnerable habitats and priority species, and described how to manage impacts and risks related to biodiversity. This plan

was integrated into Shell Gabon's environmental management system and translated into operational procedures. These procedures included, among other measures, reducing the width and number of roads built, stricter speed controls on these roads, limiting the size of rigs and favoring the use of existing rigs in drilling operations, and banning hunting, fishing and the transportation of game meat and weapons (Moussotsi Ikapi, 2016). However, as Shell Gabon has now handed over its shares in the onshore operation to Assala Energy (Shell, 2017), all of these gains could be lost if Assala Energy's environmental policy does not sufficiently embrace this legacy. Assala Energy's website is notably silent with regard to environmental standards (Assala Energy, 2021).

When energy or mining projects cause substantial environmental impacts, compensatory measures also can be implemented to mitigate these impacts. This is the case, for example, in Cameroon, where the construction of the oil pipeline between Chad and Cameroon led to the destruction of vast areas of forest along the path of the pipeline. Two national parks, Mbam and Djerem and Campo-Ma'an (the latter including a former wildlife reserve), were established to compensate for this damage.

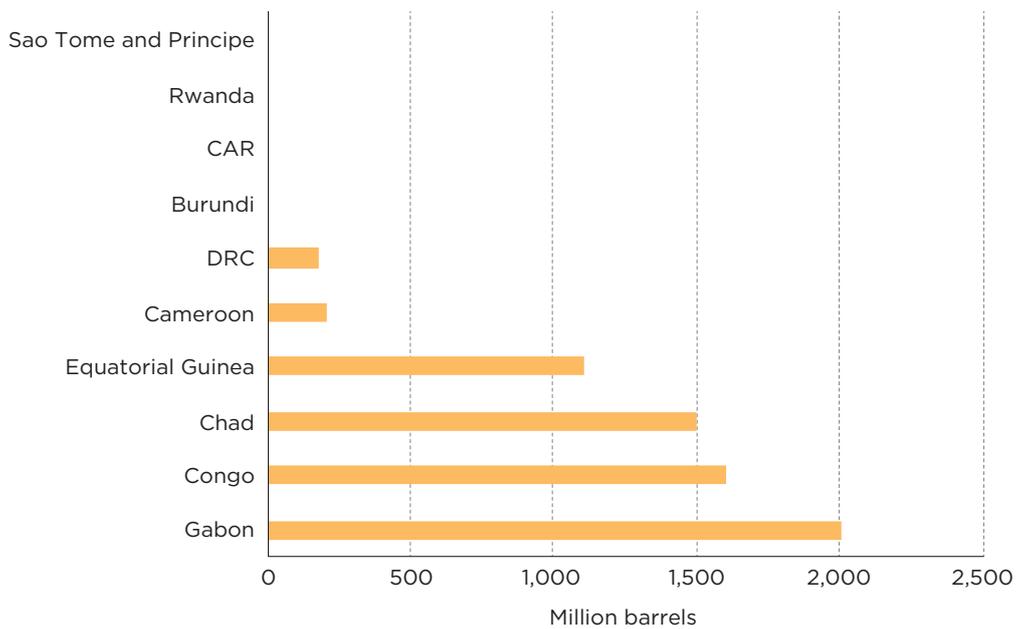
2. The specific situation of certain mineral resources in Central Africa

2.1 Oil

Central Africa is located in the Gulf of Guinea oil arc. With 6.58 billion barrels of proven oil reserves in 2020 (Figure 2a; Index Mundi, 2020a), the area is one of the oil-producing powerhouses in sub-Saharan

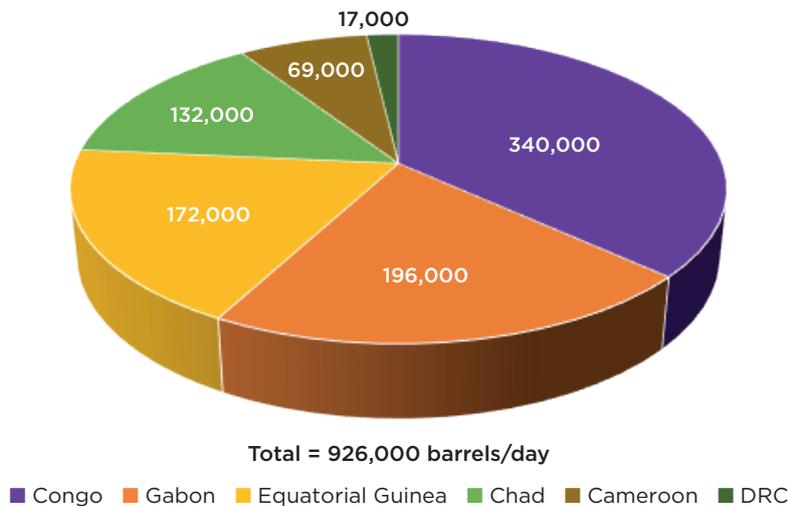
Africa, ranking third behind Nigeria and Angola, with an output of 926,000 barrels/day (Figure 2b). The Central African Economic and Monetary Community (CEMAC) estimated oil production at 45.9 million tons in 2019 (Mbadi, 2020), including 17.4 million tons for Congo (about 37%), 10.9 for Gabon, 8.2 for Equatorial Guinea, and 6.7 for Chad (BP, 2020).

Figure 2 - Oil reserves and production in Central Africa



a) Proven reserves of crude oil (2020)

Source: Index Mundi (2020a).



Total = 926,000 barrels/day

■ Congo ■ Gabon ■ Equatorial Guinea ■ Chad ■ Cameroon ■ DRC

b) Oil production (2019)

Source: Index Mundi (2020b).



The economies of several countries in the subregion are heavily dependent on oil resources. For example, crude oil exports in 2019 accounted for 67.5% of Gabon's total exports, 73.6% of those of Chad, 64.1% of Congo, 68.5% of Equatorial Guinea, and 38.3% of Cameroon (OEC, 2020). In 2020, the crisis triggered by the coronavirus epidemic led to a drop in prices that may prove to be catastrophic for growth and government revenues, although the decrease in government revenues could be offset, at least in part, by increased production (Mbadi, 2020). Although prices have been rising since the end of November 2020, pointing to a better year in 2021, they remain relatively unstable, dependent on both the recovery of the global economy and negotiations between producing countries (Aufrand, 2021).

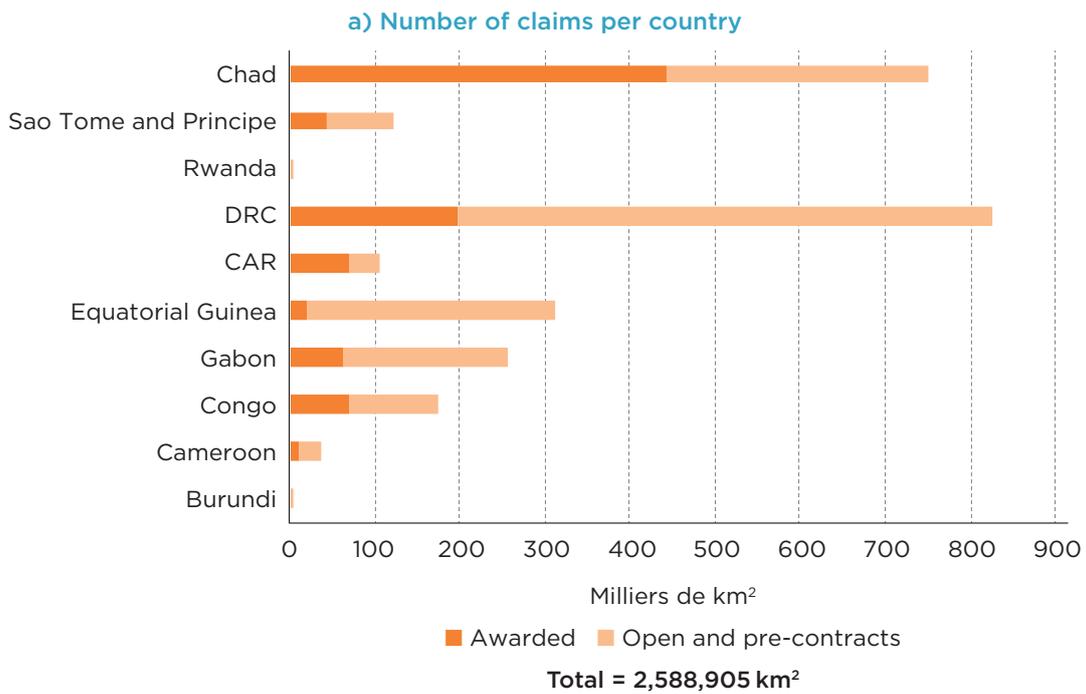
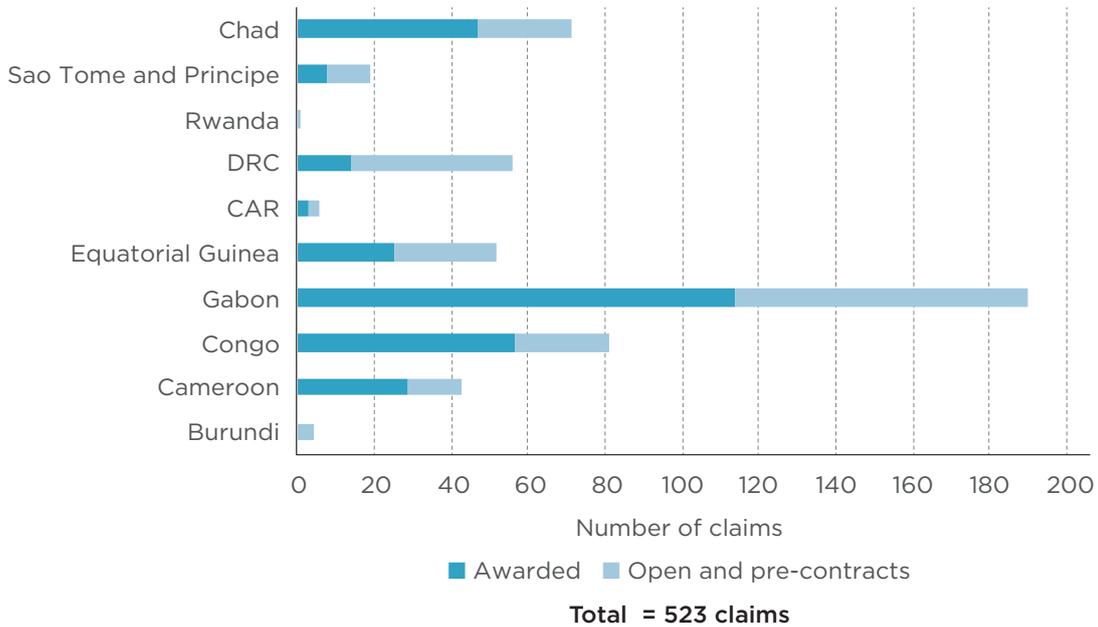
Across all of Central Africa, the oil and gas claims that have been granted or are open and in the process of being contracted amount to approximately 520 claims, and currently cover nearly 2,590,000 km² (Figure 3). These numbers refer mainly to oil (and oil and gas) claims, with gas-only claims representing a very small minority. Of this total, almost 297 claims have been awarded that cover an area of almost 920,000 km². Many awarded claims are in the exploration phase, and most of the claims in the exploitation phase are offshore.

With the notable exception of Chad, a landlocked country, and a few onshore fields in Gabon, most of the oil produced in Central Africa comes from offshore reserves. The oil is relatively easy to produce and safe from potential security issues, unlike oil produced onshore. Offshore production has the advantage of limiting potentially conflictual interactions between companies and local communities, allowing production to be protected from social and civil unrest. In the Congo, for example, oil production was not affected by the 1997-1999 civil war because the fields were located offshore, far from the conflict zones.

Thus far, this oil operations setup has limited interactions with protected areas. However, two new elements should be considered. First, in 2017 Gabon created the largest network of marine reserves in Africa, covering more than 50,000 km² (UNEP-WCMC & IUCN, 2020). This suggests that there will be significant interactions in the future between protected areas and oil exploitation, due to both the existing, largely offshore activity and new, recently identified marine deposits (Mbadinga, 2018). The current or foreseeable impacts of these extractive activities must be controlled and reduced as much as possible (pollution and traffic, in particular).

The second element to bear in mind is that the relatively limited nature of onshore oil exploitation

Figure 3 - Oil and gas claims awarded or open and under contract in Central Africa (2020)



b) Surface area by country

Awarded: operated (exploration and exploitation); Open and pre-contracts: under negotiation, pre-award, application, open. Source: WWF-SIGHT

activity could change overnight with the discovery and development of oil fields in the Central Congo Basin, either in Congo or in DRC. In Congo, two oil companies have reported the characteristics of the first onshore deposit discovered in the Cuvette region, situated in the north of the country, which

could allow a fourfold increase in national production (Anon., 2020a).

Despite its economic importance, the oil industry in Central Africa has had only a limited impact on other sectors (Carbonnier, 2013). The management of oil revenues still lacks transparency, despite some sporadic

progress in relation to EITI (ITIE, 2020a and b). Foreign companies are driving oil operations through a framework of concession and production-sharing contracts established with the States.

States in the subregion seem increasingly aware that it would be in their interest to diversify their partners. This diversification could be a way to access better dividends through competition between oil operators. Furthermore, it allows countries to escape from a quasi-monopolistic situation that has to date benefited their traditional partners. This is partly the basis for the relationships that are developing with new countries, especially with BRICS (Brazil, Russia, India, China and South Africa).

The sector has been experiencing extensive upheaval for several years, with legislative changes and, in some cases, the replacement of major traditional companies – and industry leaders – by other, medium-sized operators or by Asian state-owned companies or their subsidiaries (Augé, 2018; DGT, 2020b; Le Bec, 2020b). These oil companies are constantly adapting their portfolio of exploitable reserves by focusing on high-value areas and reducing operating costs. These costs are higher offshore than onshore, which could herald a major shift in exploitation on the continent depending on price levels, oil deposits, and political and security situations.

Medium-sized companies often operate with limited budgets and may not be very sensitive to environmental issues (Le Bec, 2020a). States will therefore have a decisive role to play in regard to both these social and environmental subjects and global energy strategies. This is the case in Gabon, for example, where the industry heavyweights Total and Shell have been replaced by two medium-sized companies, Perenco and Assala Energy; in a few years, these two may become the largest oil producers in the country (Le Bec, 2020a and b). However, these companies are not very transparent and are much less concerned about social and environmental issues than top tier companies. Tensions are still running high between supporters of unbridled exploitation of natural resources and those advocating for economic diversification and the sustainable development of the country. However, the transition initiated by some of the major companies, reinforced by the crisis induced by the Covid-19 pandemic, may offer opportunities for agreements between stakeholders

and encourage the evolution of these medium-sized companies (reduction of their production, reduction of their environmental footprint, transition to renewable energy; Marot, 2020).

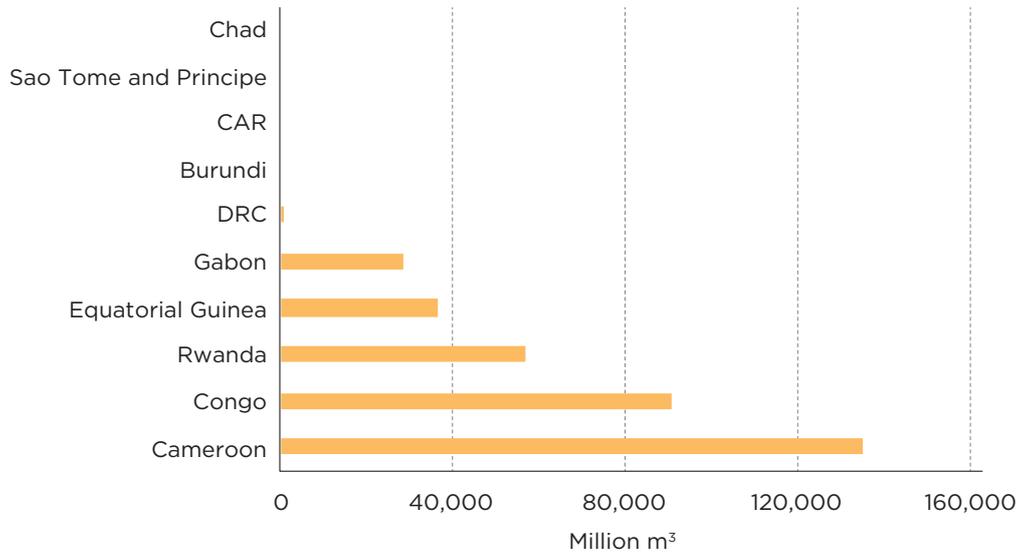
2.2 Natural gas

The countries of Central Africa have a long coastline. As with oil, the offshore exploitation of natural gas has allowed impacts on terrestrial ecosystems and protected areas to be limited; its impact on marine protected areas needs to be studied.

Natural gas reserves in the subregion were estimated to be equal to 348.5 billion m³ in 2020 (Figure 4a; Index Mundi, 2020c). Production was 8.8 billion m³ in 2019 (Figure 4b; Index Mundi, 2020d). Equatorial Guinea is the main producer of natural gas, with production of about 6.1-6.6 million m³ depending on the source (70% of the regional total), or 21,000 barrels/day of Liquefied Natural Gas (LNG) in 2019 (Index Mundi, 2020d; BP, 2020).

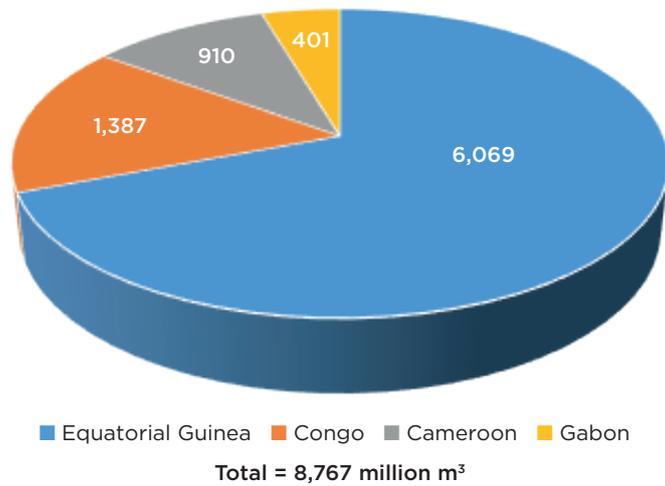
Production and the discovery of new oil fields in Equatorial Guinea are unlikely to offset the reduced natural output from wells, which has been declining since the late 2000s (BP, 2020). However, the contribution of natural gas exploitation to the country's hydrocarbon production is greater than in the past. Gas sales account for about 20% of Equatorial Guinea's export revenues (OEC, 2020). Gas, in addition to oil, should be able to maintain the country's attractiveness and its strategic position in the race for energy supplies. However, the development of this activity is severely hampered by a lack of infrastructure and technology, as is true elsewhere in the region. Equatorial Guinea is now working to develop its entire petrochemical value chain, and is collaborating with the private sector to create a highly developed and vertically integrated domestic industry. In March 2014, construction began on an offshore gas compression platform located 32 km north of Bioko Island, on the Alba B331 field. The American company Noble Energy intends to start an offshore LNG project in 2021, which includes the construction of a 65 km long pipeline (De Souza, 2020 and 2021). The country also is developing multiple partnerships and contacts in this field with Central African and West African countries with the aim of creating a regional Gulf of Guinea gas company.

Figure 4 – Gas reserves and production in Central Africa



a) Proven natural gas reserves (2020)

Source: Index Mundi (2020c)



b) Gas production (millions of m³/year; 2019)

Source: Index Mundi (2020d)



Congo produced about 7,000 barrels/day of LNG in 2019 (BP, 2020). The country's proven natural gas reserves are the fifth largest in sub-Saharan Africa. However, a lack of infrastructure and appropriate technologies is affecting commercialization. A small part of the gas generated by oil production is transformed into LPG (Liquefied Petroleum Gas), but most continues to be reinjected into oil wells, flared or dissipated into the atmosphere, as is still too often the case in many countries.

In Cameroon, a gas reserve was discovered in the Rio del Rey offshore basin, not far from Bakassi Peninsula. Cameroon began exporting LNG in 2018, but LNG and LPG production also supplies the domestic market for the sale of home gas cylinders to the general public. The country's priority now is to supply the local market with gas to meet domestic demand. The *Société Nationale des Hydrocarbures* (SNH) also supplies natural gas to the Kribi thermal power plant for electricity generation (Anon., 2019a). The increase in local LPG supply will be accompanied by a reduction in the substantial government subsidies in the energy sector. A new gas code was enacted in 2012 to promote this sector and facilitate this project.

Gabon announced in mid-2013 a promising discovery of gas condensates (a liquid mixture of hydrocarbons) during its first ultra-deep exploratory drilling on the Diaba exploration permit. Ninety percent of the gas produced during the oil operations is flared, vented or reinjected into the oil extraction wells. Natural gas resources currently are exploited by Perenco on two fields, Ganga and Ozangue, which supply the thermal power plants of Libreville and Port-Gentil (DGT, 2020b). The company recently reiterated its commitment to further develop the gas sector in the country; facilities for LPG production serving the domestic market are expected to be built in *Ogooué Maritime* province (Ngoma, 2020).

Lastly, Rwanda's intention to enter this production sector should be noted, with an agreement signed in 2019 between Gasmeth Energy and the Rwandan government for the recovery of methane from Lake Kivu. This agreement includes the construction of a gas extraction, processing and compression plant (De Souza, 2021). This operation will make it possible to secure the shores of the lake by preventing the

formation of toxic gas bubbles. Most importantly, it will provide domestic gas for cooking, reducing dependence on wood and charcoal in the most densely populated region in Africa.

2.3 Minerals

2.3.1 General presentation of the sector

Central Africa has extensive and varied mineral resources (copper, cobalt, manganese, nickel, iron, uranium, gold, lead, zinc, diamonds, rutile, barite, rare earths) and non-mineral resources (precious stones, phosphates and coal). Unlike oil, whose potential resources are linked to large sedimentary basins, most of the subregion's mineral resources are located in ancient Archean and Proterozoic land forming a broad halo surrounding the Central Congo Basin (Milesi *et al.*, 2006; Edwards *et al.*, 2014; Noiraud *et al.*, 2017). Some large mining areas stand out from the rest, such as the Katanga copper belt in southern DRC, large diamond-rich areas in CAR and southern DRC, very rich iron deposits on the border between Cameroon, Gabon and Congo, and an extensive swathe of land in eastern DRC with an abundance of tin and various minerals.

For most countries in the subregion, developing the mining industry is a national priority. However, this sector is not represented in the exports of Sao Tome and Principe or Equatorial Guinea, and Cameroon only exports some gold and refined aluminum, which contribute 9% and 2% of exports respectively (OEC, 2020). The mining sector accounts for 20-30% percent of exports from Gabon, Chad, Congo, and CAR (20%, 21%, 25%, and almost 29% of exports by value, respectively; OEC, 2020), but the nature of the sector varies from country to country: manganese mining and processing in Gabon; gold mining in Chad and CAR, as well as diamonds in CAR (with a high proportion of quality gems); and copper mining and processing in Congo, which inaugurated a polymetal refining plant in 2019 (Kombo, 2021).

Nevertheless, DRC is "the" mining country in the region. The mining sector contributed 91% of the country's total exports in 2019, chiefly copper and cobalt, but also many other minerals in addition to diamonds (mainly for industrial use) and gold; the



latter two productions constitute 3.5% of official exports in value (OEC, 2020). Finally, mineral exports account for just over 45% and 55% of Rwanda's and Burundi's exports, respectively, mostly gold but also other minerals (niobium, tantalum, vanadium, tin, tungsten, etc., accounting for about 10% of exports).

These figures demonstrate, if proof were needed, the importance of the mining sector and the national and international stakes involved. The sector is strongly influenced by global economic and geostrategic issues due to the involvement of large international companies and the supply needs of major economic powers that influence the markets. This raises questions about the provenance of Burundi and Rwanda's mining output, which is likely to be partly – or in some cases largely – sourced from DRC (Noiraud *et al.*, 2017); much of the exploitation of gold and coltan, for example, is informal and illegal (Lopez *et al.*, 2017; Smith, 2020).

Mining in Central Africa is carried out on both an industrial scale, through large multinational companies, and an artisanal scale (Noiraud *et al.*, 2017). For example, approximately 12 million people are estimated to be involved in artisanal mining and exploitation in Africa. Their total number in Central Africa is not known precisely, but depending on the source, it is estimated that there are between 1.5 and several million diggers in DRC alone, and approximately 50,000 in CAR (AMDC, 2017; DGT, 2020d). These figures remain very approximate due to the difficulties involved in counting these people, who often live in isolated territories and/or outside the law; this is, for example, largely the case in North and South Kivu, in eastern DRC (De Faily, 2013). In some regions, these small-scale diggers increasingly are being joined by Korean, Chinese, or national entrepreneurs with some capital, who practice semi-mechanized, “semi-industrial” exploitation (as is the case in eastern Cameroon; Voundi *et al.*, 2019).

Gold, diamonds, tin, tantalum (coltan), and other such minerals are mainly exploited by artisanal miners because this type of exploitation does not require large investments or infrastructure. This is the case for gold mining, which has developed considerably in the Tri-national Dja-Odzala-Minkebe (TRIDOM) area on the borders of Congo, Gabon and Cameroon, which also contains extensive reserves of excellent

quality iron. Most of these artisanal miners have had little or no education, and barely make a living from the activity. They often are poorly or not at all organized, and do not hold mining titles (De Faily, 2013).

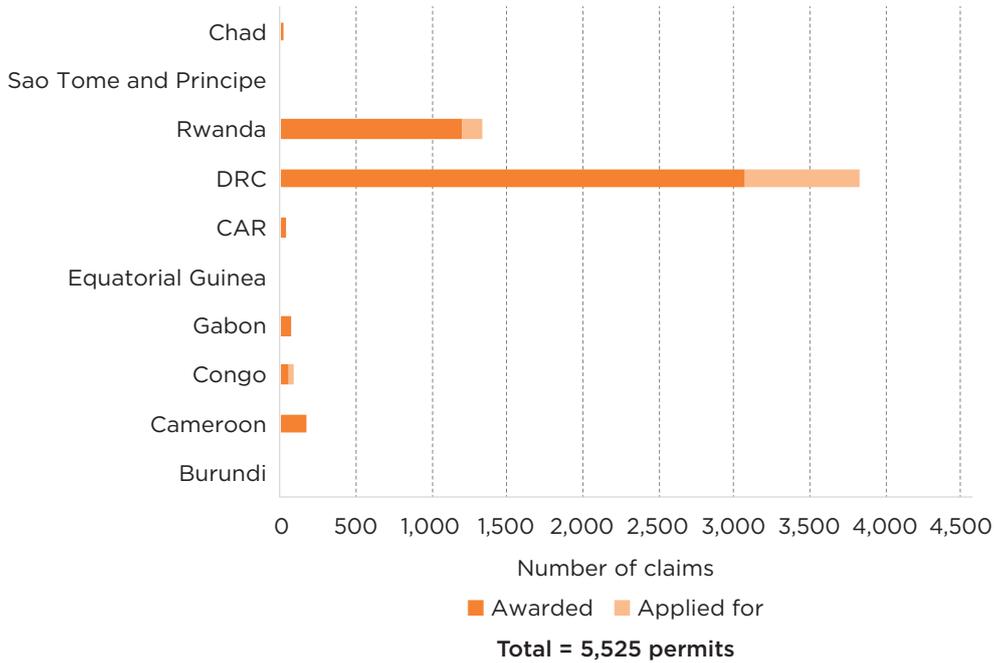
Consequently, the sector is falling prey to urban elites with little concern for social or environmental impacts, and even to armed groups who view mining as an easy way to obtain funds to buy weapons. In many cases, and in the absence of effective rule of law, the mining sector is too often “shaped by smuggling” (Lopez *et al.*, 2017; Smith, 2020). All of this has harmful effects on the environment, including on endangered species such as gorillas (Boekhout van Solinge, 2008). Moreover, this situation leads to numerous human rights abuses, such as child labor, forced labor and sexual abuse (Reed & Miranda, 2007; HCDH, 2010; De Faily, 2013; Edwards *et al.*, 2014; AMDC, 2017). Eastern DRC has been the scene of slavery-like practices, rape, and mass killings for several decades in connection with the exploitation of coltan and other mineral ores. The electronics industry has an unquenchable thirst for these ores, which are used in our cell phones and miniaturized electronic devices (Sutherland, 2011; Anon., 2020b).

2.3.2 Brief overview of mining

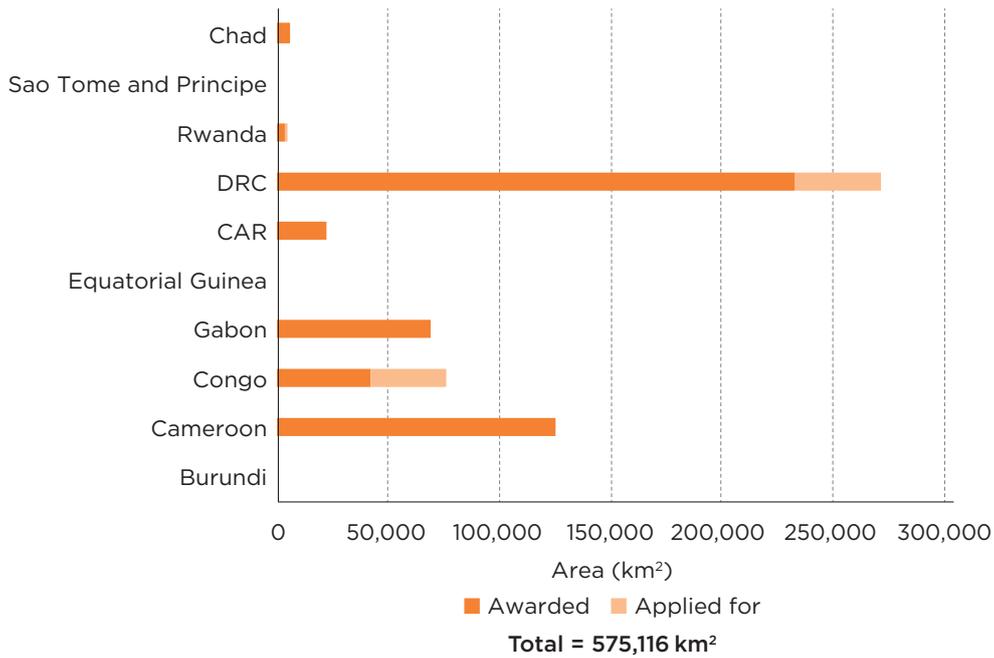
Across all of Central Africa, the mining claims that have been granted or applied for currently occupy slightly over 10% of the land surface, or more than 575,000 km², for a total of over 5,500 permits. At present, the majority are claims that have been granted, with nearly 4,600 claims covering more than 502,000 km² (Figure 5). Naturally, the situation varies greatly from one country to another; DRC is unsurprisingly in the lead with more than 3,800 permits covering over 270,000 km². Rwanda, second in terms of the number of permits (over 1,300), has the smallest surface area allocated (approximately 4,300 km²), which is due to the small size of the country. In contrast, Cameroon is second in terms of area covered by granted claims, but has only issued 165 permits for an area exceeding 125,000 km².

The mining industry forms the core of DRC's economy (DGT, 2020e). Its industrial mining sector is the oldest and most developed in the subregion, contributing nearly 21% to the national budget and 17.8% to GDP in 2016 (DRC & World Bank, 2016).

Figure 5 - Mining claims granted and applied for in Central Africa (2020)



a) Number of claims per country



b) Surface area by country

Source: WWF-SIGHT

Despite this long history, the overall mineral potential of DRC is not well known (Hund *et al.*, 2013). Available information indicates a serious potential for gold, iron, diamonds, potassium, manganese, phosphate and oil sands, lithium, uranium, etc. Industrial production of copper and cobalt is sourced from the copper belt in the southeast of the country. This

production is significant, with DRC the fifth largest producer of copper and the top producer of cobalt in the world. The industrial mining sector is dominated heavily by Chinese companies; Gécamines, the main Congolese player, is no longer a mining operator but owns shares in many foreign-owned companies (DGT, 2020d). The two main challenges facing



operators are electricity shortages and the dilapidated state of land infrastructure, which severely limits the transportation of mining commodities (DGT, 2020c). In addition, mining companies are sometimes forced to suspend operations due to volatile security situations in some regions (Anon., 2019b).

It should be noted that gold and certain minerals such as coltan are mainly mined in an artisanal manner in DRC. In fact, many of these minerals are mined illegally and leave the country without being accounted for and without the miners paying the government taxes on them (DGT, 2020d; Smith, 2020). The high level of exports of gold and some minerals from Burundi, Rwanda and Uganda owe much to DRC. In the case of Rwanda, the country has put in place a land use planning and cadastral system that has made it possible to legalize and organize mining much more efficiently compared to other countries in the subregion (Warnest *et al.*, 2012; Lehman *et al.*, 2017). The large number of registered permits, relative to the small size of the country, is indicative of this (see Figure 3a).

Gabon also has been recognized as a mining country for about half a century. The country is

located in the “heart of the Congo Craton”, and has exploited industrial deposits of uranium and manganese for decades. It also has extensive iron and gold deposits. Growing demand for non-renewable mineral resources is one of the greatest threats to sustainable development. However, this trend is affected by the instability of prices on the world market. The prices of certain minerals such as iron indeed have fallen drastically since 2009 (Anon., 2014). Consequently, many exploration projects begun in 2005 in Gabon, Congo and Cameroon following an upturn in global iron prices ultimately were not implemented.

In Congo, vast potash deposits have been under study for several years (Kouilou region, on the country’s Atlantic coast). They have shown great potential and a high return on investment, and exploitation could begin soon (Caslin, 2018). These deposits will undoubtedly lead to heavy environmental impacts in southern Congo. Quite recently, semi-industrial gold mining by Chinese operators has developed very rapidly in the Congo section of the TRIDOM inter-zone, causing considerable environmental impacts (water pollution) and presenting strong competition to artisanal gold miners (Noiraud *et al.*, 2017).

3. Are extractive industries a danger for protected areas and biodiversity conservation?

3.1 Pressure from extractive industries on protected areas

Many oil and mining, industrial, semi-industrial and/or artisanal operations are located near or straddle protected areas. When operating, these mining and oil claims put considerable pressure on natural resources within and near protected areas.

By their very nature, mining operations cause significant direct damage to the environment through soil stripping and the chemical pollution of soils and waterways, destroying aquatic biodiversity in the process (Noiraud *et al.*, 2017; Voundi *et al.*, 2019). These activities also are likely to damage human and animal health through heavy metal pollution, as is the case in Katanga, DRC (Kahilu Mutshma *et al.*, 2015; Mateso, 2016). All of these risks and damage could be mitigated if laws governing mining and rules of good governance were strictly enforced. Unfortunately, the mining sector in many Central African countries is plagued by institutions which have been subverted to serve the elites, corruption, a lack of transparency, poor revenue redistribution and low societal participation (Philippot, 2009).

One should note that with regard to the impact of extractive industries on protected areas, the construction of mineral transportation infrastructure (mining sites, roads, railroads, pipelines, etc.), and migratory flows involving workers, job seekers and their families, generally exert tremendous pressure on natural resources (deforestation, poaching, etc.) that surpasses the direct impact of the exploitation itself (Reed &

Miranda, 2007; Noiraud *et al.*, 2017). Hunting pressure is mainly focused on protected areas because they remain wildlife reservoirs and they are not, for many reasons, always managed effectively.

As mentioned earlier, mining projects attract poor populations. These communities generally do not benefit from the mining projects; they are there to feed and supply mining centers and camps with various materials such as hunting meat, charcoal and various forest products. All of this generally results in a degradation of living conditions and the environment (Voundi *et al.*, 2019; Chuhan-Pole *et al.*, 2020).

Numerous NGO reports and scientific studies also denounce the human rights violations associated with mining (HCDH, 2010; CREF, 2015). The mining sector has been known to have close links to armed groups and accept practices of enslavement and pauperization when the interests of a few key actors are at stake. Gold mining and coltan exploitation in eastern DRC are clear examples (Le Billon & Hocquard, 2007). Human misery and insecurity are two essential ingredients for the uncontrolled exploitation of natural resources, including biodiversity. Protected areas are paying the price.

Under these conditions, if governments strengthen protected area conservation and management measures, and mining operators implement environmental and social management plans effectively and efficiently, the effects of these multiple pressures can be mitigated. However, there remains significant room for improvement in the systematic implementation of environmental impact assessments and the application of the avoid-reduce-offset sequence at all stages of mining projects (Cigorogo *et al.*, 2020). The mining sector still generates significant environmental and social impacts that could be avoided or minimized.



3.2 Land use planning in question

The problem posed by claims granted to extractive industries that overlap protected areas reflects the pre-eminence of one land use over another. It is primarily a land use planning issue (Doumenge *et al.*, 2016). Unfortunately, few Central African countries have implemented or plan to develop an integrated, participatory, transparent approach to spatial planning and land use. Constrained by a small geographic area and a very large population, Rwanda implemented a land tenure legalization system and a land use plan that were mainly intended to strengthen social peace and promote agricultural production (Ali *et al.*, 2014; Chigbu *et al.*, 2019; RNRA, 2020). However, the plan also made it possible to safeguard areas dedicated to biodiversity protection. Other countries, such as DRC, Cameroon and Gabon, have indicated an intention to implement land use plans, but the process of preparing these plans has barely begun.

Land use decisions involve weighing the value of biodiversity and the ecosystem services that biodiversity provides against the economic value of extractive activities. On the one hand, the importance of biodiversity and forests are rarely recognized and are systematically underestimated, including their contribution to maintaining ecological balances, combating climate change, the survival of the poorest and employment (see, for example, chapters 9 and 10 of this book). On the other hand, the large sums of money involved in large oil and mining projects are emphasized, although the social benefits delivered by multinationals often are not – or at least very inadequately – commensurate with the taxes and revenues they pay to States (Kolk & Lenfant, 2010; Noiraud *et al.*, 2017). In the vast majority of cases, mining revenues remain concentrated in just a few hands and the sector does not promote the development of diversified and stable economies, stifling in advance any attempt to develop a sustainable biodiversity economy.

All this creates an imbalance in decision-making that harms biodiversity and protected areas as well as rural communities. Given the economic importance of the extractive industries and the significant financial returns they can generate for companies,

governments and certain political and administrative elites, protected areas run a high risk of being downgraded in favor of industry. This is all the more likely because protected areas are often perceived, by both governments and rural communities, as a constraint. Years of intensive conservation efforts consequently can be wiped out by the discovery of an economically valuable mineral substance inside a protected area.

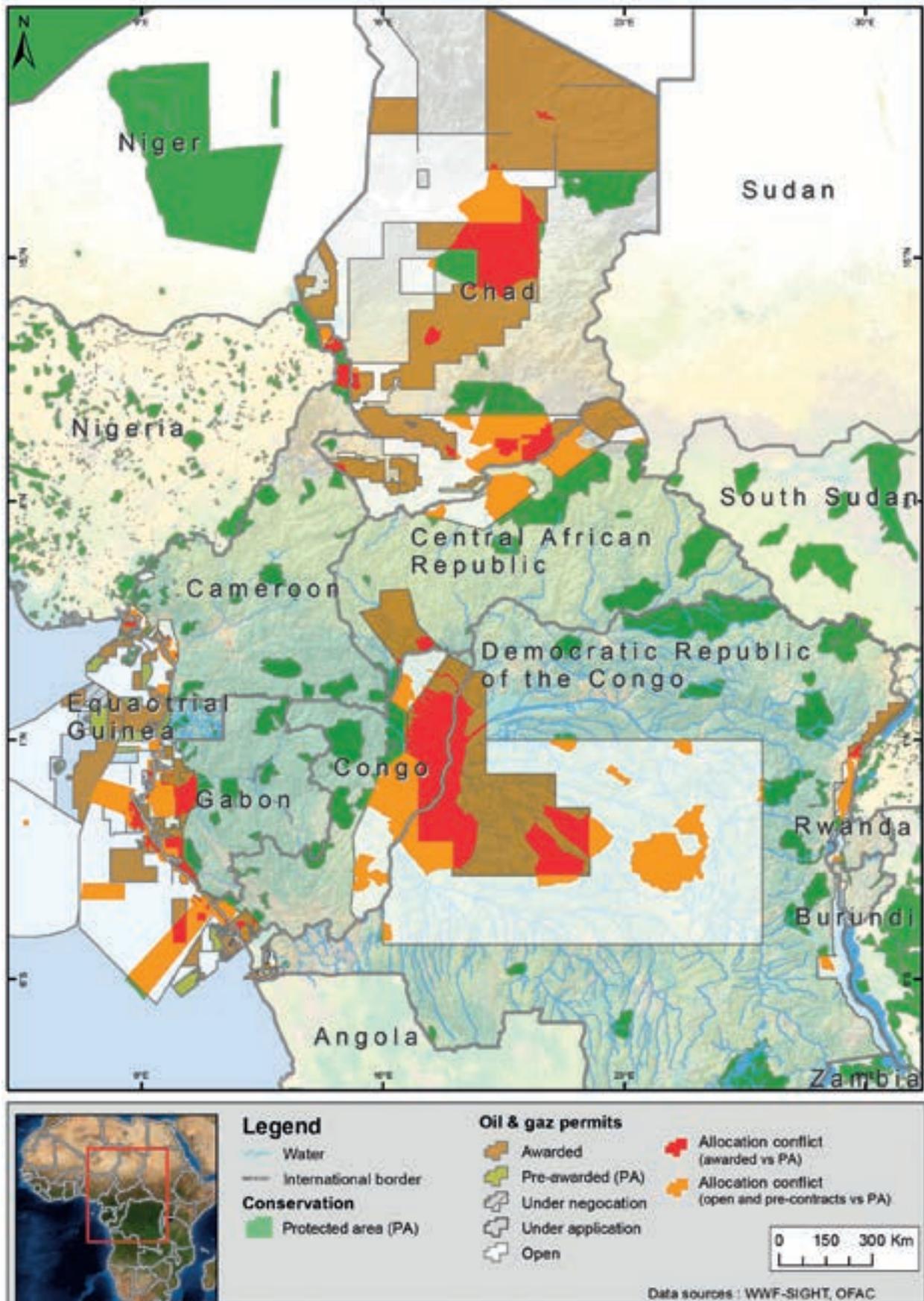
3.3 Overlap of oil and gas concessions and protected areas

About ten awarded oil (and more rarely gas) contracts overlap the network of Central African protected areas, covering an area of about 263,000 km², or 22.8% of the surface of protected areas in the subregion (Table 1 and Figures 6 and 7). These figures include both land and marine protected areas. The method that was used to carry out these assessments is detailed in Appendix 1. It should be noted that we considered both protected areas with national status and territories with international status, linked either to an international convention (World Heritage, Ramsar) or to an international network such as the biosphere reserve network.

In the offshore sector, the complete set of claims (granted, open or under pre-contract) cover the entire Exclusive Economic Zones (EEZ) of the countries along the Atlantic coast. Onshore, they are present in two large areas – the Central Congo Basin and the Chad Basin – but also in the coastal sedimentary basins and along the Albertine Rift (Figure 6). While currently oil production in the subregion is predominately offshore (except in Chad, and partially in Gabon), onshore exploration claims have increased significantly, raising the possibility of increased onshore production.

Depending on the country, the proportion of protected areas affected by claims operated by industrial companies (awarded) varies greatly, ranging from none to nearly 36% of national networks. Burundi, Equatorial Guinea and Rwanda have no conflicts between oil and gas claims and protected areas. In contrast, the protected area networks of Congo, Gabon, DRC and Chad are seriously threatened by these claims (Table 1).

Figure 6 - Spatial distribution of oil and gas claims overlapping with protected areas



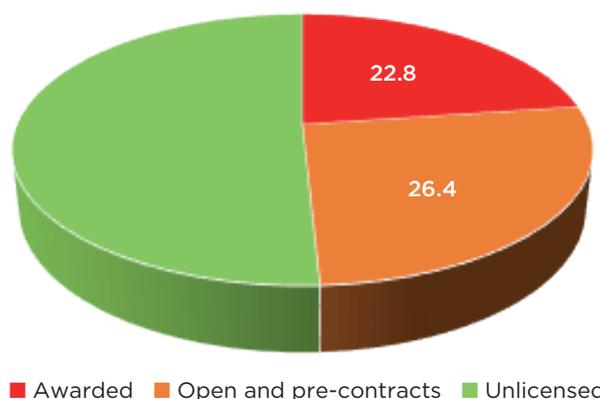
Source: WWF-SIGHT

Table 1 - Oil and gas claims overlapping protected areas

Territory	Type of claim	Claims overlapping protected areas		Protected areas impacted	
		Number	Area (km ²)	Number	% area
Burundi	Awarded	0	0	0	0
	Open and pre-contracts	3	90	4	6.4
Cameroon	Awarded	7	6,345	7	9.3
	Open and pre-contracts	9	7,518	9	11.1
Congo	Awarded	8	44,622	11	25.2
	Open and pre-contracts	16	56,150	15	31.7
Gabon	Awarded	19	27,213	39	21.1
	Open and pre-contracts	19	62,171	40	48.2
Equatorial Guinea	Awarded	0	0	0	0
	Open and pre-contracts	12	1,664	10	24.2
CAR	Awarded	5	2,512	6	2.0
	Open and pre-contracts	9	22,732	12	17.9
DRC	Awarded	13	117,042	11	25.8
	Open and pre-contracts	22	104,220	20	23.0
Rwanda	Awarded	0	0	0	0
	Open and pre-contracts	1	437	1	15.8
Sao Tome and Principe	Awarded	0	0	0	0
	Open and pre-contracts	0	0	0	0
Chad	Awarded	6	65,116	9	35.7
	Open and pre-contracts	3	50,011	6	27.4
Central Africa	Awarded	10	262,850	83	22.8
	Open and pre-contracts	20	304,993	118	26.4

Awarded: operated (exploration and exploitation); Open and pre-contracts: under negotiation, pre-award, application, open. Source: WWF-SIGHT

Figure 7 - Proportion of the Central African protected area network impacted by oil and gas claims (%)



Awarded: operated (exploration and exploitation); Open and pre-contracts: under negotiation, pre-award, application, open. Unlicensed: no oil or gas claims. Source: WWF-SIGHT

Moreover, the projected allocation of new claims potentially threatens another quarter of the protected area network, bringing the total overlap to nearly half of the surface of protected areas in Central Africa (Figure 7). A large proportion of the protected areas in Congo, Gabon, DRC and Chad would be threatened (Table 1). Apart from Sao Tome and Principe, no country is spared.

Although under certain circumstances oil exploitation can considerably limit its environmental and social impacts, and even prove to be a key player in sustainable development, the environmental impacts of this exploitation could prove to be very negative, both on land and in the marine environment (Dallmeier *et al.*, 2016; Aghalino & Eyinla, 2017; Amarachi & Kabari, 2020). On land, the strongest potential impacts of oil exploitation can be expected in swamp forests, which are more easily subjected to pollution (Ite *et al.*, 2013). Everywhere, production and disposal infrastructure and indirect impacts will be significant, at least under current conditions. During the exploration phase, the destruction of forests also can cause significant impacts, particularly if the soil is fragile, as is the case in coastal sedimentary basins (Doumenge, 1992).

3.4 Overlap of mining concessions and protected areas

3.4.1 Central Africa

In Central Africa, at least for seven of the ten countries concerned, there are currently almost

4,590 awarded mining contracts covering an area of 502,150 km². These mining claims largely spare the Central Congo Basin (Figure 8). However, they do occupy extensive land in two major geographic zones: 1) the first encompasses the entire South Congo - Gabon - Cameroon axis, 2) the second occupies all of the landscape and ancient lands bordering the Congo Basin, mainly in the east (Albertine Rift) and south (Kasai and Katanga plateaus). These two large areas also are particularly rich in terms of biodiversity and endemism (Edwards *et al.*, 2014; Dagallier *et al.*, 2019).

Within this ensemble, 167 awarded claims overlap protected areas, covering just over 42,500 km², or 3.7% of Central Africa's protected areas (Table 2 and Figures 8 and 9). If mining claim applications are added, the total number of concessions overlapping protected areas covers 4.6% of their surface. While mining claims overlap a much smaller part of protected areas compared to oil permits, it should be noted that the impact of mines on biodiversity is often much greater than that of onshore oil wells, particularly when the latter observe appropriate measures (Reed & Miranda, 2007; Dallmeier *et al.*, 2016; Noiraud *et al.*, 2017). Moreover, it should be remembered that we are reporting here only official mining claims, and that illegal artisanal mining and semi-artisanal mining are widespread, causing a great deal of both ecological and social damage (De Faily, 2013; Edwards *et al.*, 2014). The specific situation in a few countries is presented below.



3.4.2 Cameroon

Currently, mining claims overlap more than 12,300 km² of protected area land in Cameroon, an area only slightly less than in DRC, for a much smaller number of permits (Table 2). These claims affect 18 protected areas. Contrary to what might be expected with improved land use planning, these figures have increased since 2012. At that time, the government had granted 30 mining exploration permits in 12 protected areas, covering approximately 9,400 km² (Schwartz *et al.*, 2012).

Most of the overlap areas involve prospecting mining permits (exploration). The main national parks affected are Lobeke, Boumba-Bek, Nki, Campo-Ma'an and, to a lesser extent, Korup, in the southern forest region. In the open woodlands and savannas of the north, Bouba-Njida and Benue parks are most affected. Also threatened are other sites that have not yet been classified but which are very important for the conservation of Cameroon's biodiversity, for example the Ngoyla-Mintom forest reserve and the Ebo forest.

Government representatives have wanted to substantially develop the mining sector for several years, as shown by the creation of SONAMINES (National Mining Company) in late 2020. This company's objectives will be to conduct mineral resource inventories in partnership with other actors, implement exploration and exploitation activities, ensure the restoration of sites after exploitation and obtain stakes in all companies with links to the mining sector (S.A., 2020).

However, these objectives have not yet been translated into operational industrial projects due to a number of unfavorable factors (drop in mineral prices, Covid-19, opaque governance, etc.). For example, the first major cobalt-nickel-manganese mining claim, held by the American company Geovic in southeast Cameroon (Nkamouna), still has not yet seen the light of day (Noiraud *et al.*, 2017; Anon., 2021).

Another major undertaking intended to launch Cameroon's industrial mining activity is the Mbalam-Nabebe project, operated by Camiron and Sundance Resources to exploit vast iron ore deposits on the Cameroon-Congolese border. This project is associated with the construction of a railway to the port of Kribi (about 550 km). This will profoundly change the accessibility of southern Cameroon (and

access to various protected areas), and also carries the risk of potential land use conflicts with other industrial forestry and agricultural projects (Noiraud *et al.*, 2017). As Sundance Resources was unable to start the Mbalam project, Cameroon reportedly decided to withdraw the permit and award it to a consortium of five Chinese state-owned companies; at the same time, the Congolese government also awarded the Nabebe permit to a new company (Mbodiam, 2021).

Before a mining claim is granted, the mining code requires prior approval from the relevant public authorities, which allow mining operations to be conducted in and around national parks and protected areas subject to international agreements. In 2012, an order by the minister in charge of mines prohibited illegal gold mining in protected areas in Cameroon, and made any gold mining activity in protected areas subject to prior authorization by the administrations in charge of mines, forests and wildlife, environment and nature protection (MINMIDT, 2012).

However, given the widespread presence of many artisanal gold miners in much of the country, from the south up to Adamaoua, including in protected areas, it has been difficult to enforce this ministerial order (Noiraud *et al.*, 2017). This is the case in the inter-zones of the TRIDOM landscape, both in Cameroon and Gabon. In Gabon, the government did, however, forcibly evacuate the gold mining camps that existed inside and around Minkébé National Park in 2011 and 2013 (Anon., 2013). Collaboration between the administrations in charge of mining, conservation services and even the military is necessary to clean up the artisanal mining sector, especially in protected areas.

In order to structure the artisanal sector and to promote the participation of national operators, Cameroon is trying to develop a semi-industrial mining sector with a low level of mechanization. This is the case for the mining of gold and semi-precious stones (Noiraud *et al.*, 2017). However, cohabitation between artisanal diggers and semi-mechanized Cameroonian companies, but also sometimes foreign companies (Korean, Chinese, South African, etc.), leads more often to conflictual relations than good integration (Voundi *et al.*, 2019); with sometimes very significant social and environmental impacts.

Figure 8 - Spatial distribution of mining claims overlapping with protected areas

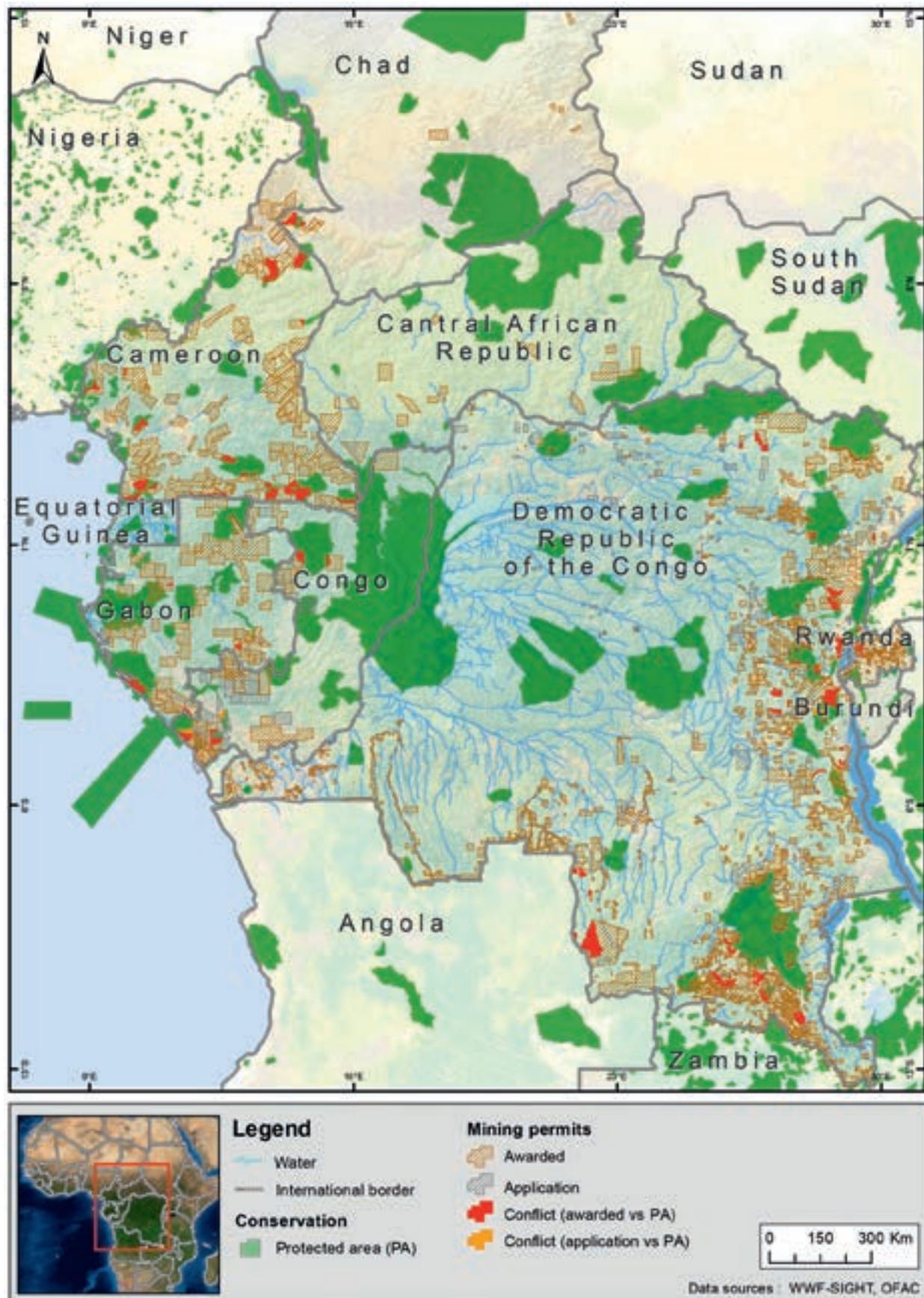


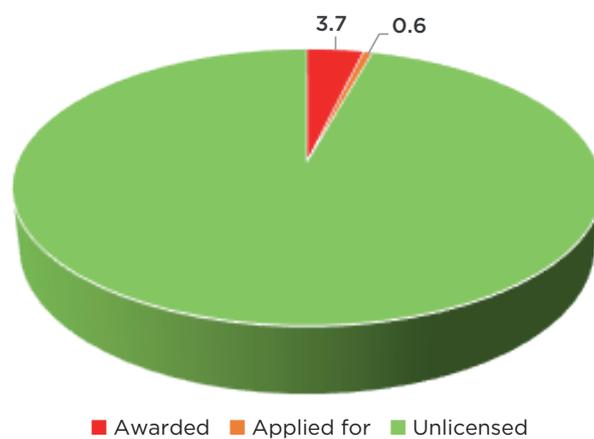
Table 2 - Mining claims overlapping protected areas

Territory	Type of claim	Claims overlapping protected areas		Protected areas impacted	
		Number	Area (km ²)	Number	% area
Burundi	Awarded	-	-	-	-
	Applied for	-	-	-	-
Cameroon	Awarded	40	12,328	18	18.1
	Applied for	0	0	0	0
Congo	Awarded	34	7,166	14	4.0
	Applied for	17	5,894	9	3.3
Gabon	Awarded	24	7,918	14	6.1
	Applied for	1	1	1	0
Equatorial Guinea	Awarded	-	-	-	-
	Applied for	-	-	-	-
CAR	Awarded	4	855	3	0.7
	Applied for	0	0	0	0
DRC	Awarded	154	12,908	25	2.9
	Applied for	40	968	17	0.2
Rwanda	Awarded	13	11	4	0.4
	Applied for	1	0	1	0
Sao Tome and Principe	Awarded	-	-	-	-
	Applied for	-	-	-	-
Chad	Awarded	2	1,333	2	0.7
	Applied for	0	0	0	0
Central Africa	Awarded	167	42,520	80	3.7
	Applied for	35	6,863	28	0.6

- : lack of data

Source: WWF-SIGHT

Figure 9 - Proportion of the Central African protected area network impacted by mining claims (%)



Source: WWF-SIGHT

3.4.3 Gabon

Along with Sao Tome and Principe and Rwanda, where tourism in protected areas is very important economically, Gabon has established a coherent and effective protected area network able to contribute to the country's economic diversification (Doumenge *et al.*, 2015). Most mining claims are located outside or on the outskirts of protected areas. However, they impact a significant portion of protected areas: 24 mining claims overlap 14 protected areas,

extending across nearly 8,000 km², or over 6% of the protected areas in question (Table 2).

However, apart from the long-standing manganese operation, there are very few active industrial claims; most are essentially prospecting permits (DGT, 2020a). An initial contract was awarded to a Chinese company for the exploitation of the Belinga iron mines, located in the north of the country on the outskirts of Minkebe National Park, but the license was returned to the public domain. The poor market

Zombe: a booming future village in the Itombwe Nature Reserve (DRC)

G. Buhendwa & F. Igunzi, ICCN

The Itombwe mountain range has long attracted the attention of naturalists and the international conservation community due to its diverse habitats and exceptionally rich fauna and flora (Doumenge & Schilter, 1997; Plumptre *et al.*, 2017). A protected area, named the "Itombwe Nature Reserve", was created there on 11 October 2006 through decree n°038/CAB/MIN/ECN-EF/2006. It is one of the most important sites for bird and primate conservation in Africa (Prigogine, 1985; De Faily & Bantu, 2010).

Itombwe Reserve has been facing many threats associated with human activities, including mining, for several years (Doumenge & Schilter, 1997; WWF, 2013). To the north of the reserve, industrial exploration sites have been granted to Banro Congo Mining, and toward the southwest, to Regal Bluent Mining (close to the outer limits of the reserve). Added to these are numerous artisanal mining sites scattered across the landscape. The quarry in Zombe is the most striking case.

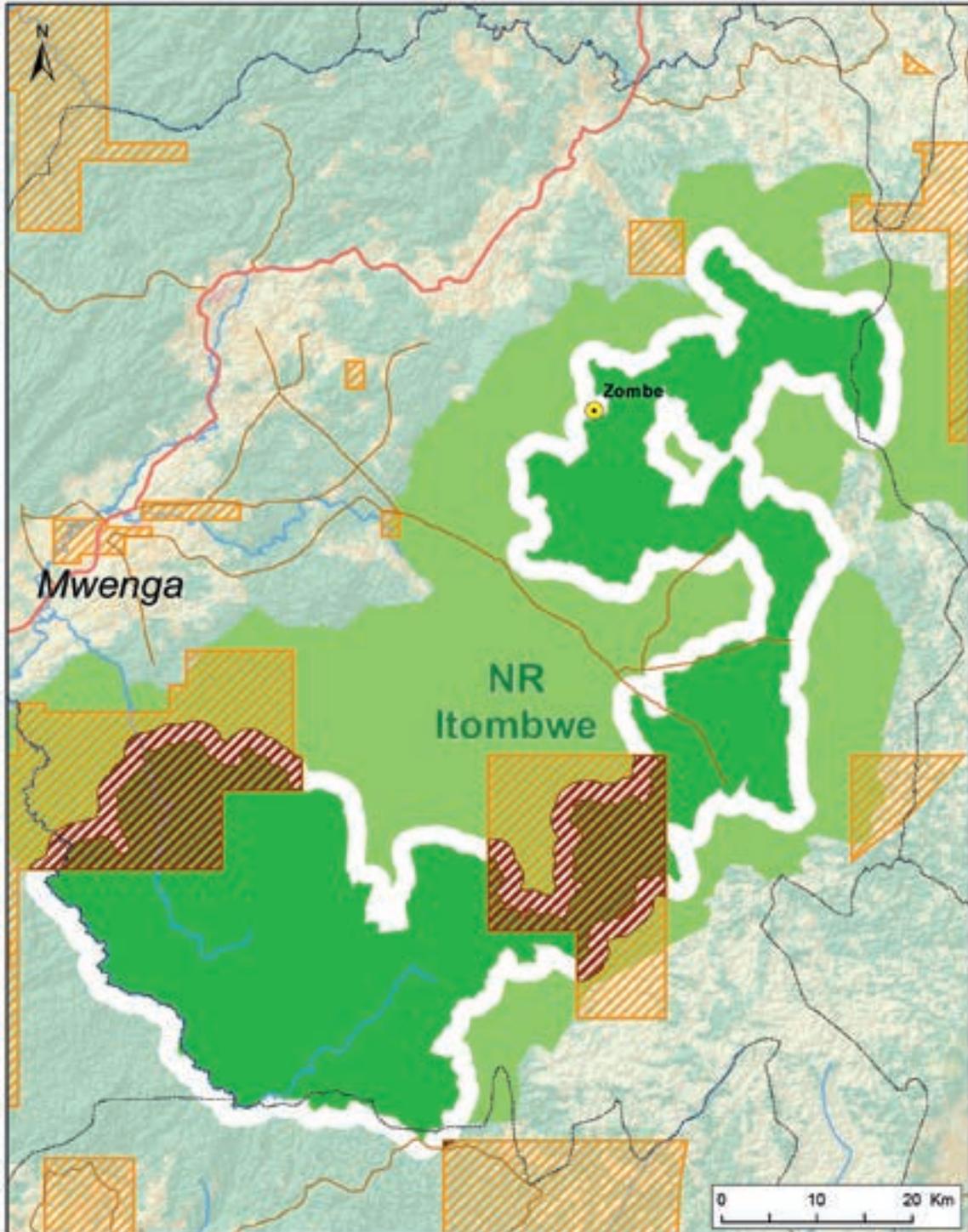
This quarry is located northwest of the reserve (Figure 10) and includes several artisanal cassiterite mines. It is equipped with a fair amount of infrastructure, which will enable it to soon become a new village inside the reserve. There is a Protestant chapel and a Catholic church, as well as a private dispensary providing primary health care to diggers. Much to the delight of the artisanal diggers, a market and numerous restaurants also are open for business.

The expansion of settlements around Zombe and the felling of trees for fuelwood are among the main threats to the biodiversity of the reserve in the Mulambozi area. With an estimated workforce of 3 1,250 artisanal diggers (according to the 2018 Quarry Management Committee report), demand for energy resources is very high. Apart from the tradition practice of the Basile chiefdom in Mwenga territory, which bans women from settling in the Zombe mine and living with men in order to build a real village, there are no other measures in place to curb this high demographic growth.

As noted by De Faily (2013), artisanal mining in South Kivu always has been characterized by a lack of structure, reflected in the weakness or absence of legal titles, collective organizations, shared governance, monitoring and evaluation, support for the sustainable management of natural resources, etc. This should be an issue of concern to all stakeholders working together for the sustainable management of Itombwe Nature Reserve's natural resources.

Zombe: a booming future village in the Itombwe Nature Reserve (DRC)

Figure 10 - Location of Zombe quarry in Itombwe Nature Reserve



<ul style="list-style-type: none"> --- Territory border Water Road — National — Local 	<ul style="list-style-type: none"> Nature reserve Strict conservation area Buffer zone Multiple use area 	<ul style="list-style-type: none"> Mining permits Mining permit (allocated or active claim) Allocation conflict (strict conservation + buffer zone) 	<p>Data sources :</p> <ul style="list-style-type: none"> (1) WWF-SIGHT (2) OFAC
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performance of minerals, particularly iron, is delaying the exploitation of these deposits, which when mined are likely to pose social and environmental risks.

In effect, although the iron deposit itself is located outside Minkébé and Ivindo National Parks, strict environmental controls on the impacts (pollution, deforestation, poaching...) generated by the exploitation of the deposit would be required to avoid damaging the integrity of these protected areas. In order to supply the mine with electricity, the Chinese company had started to build a road and prepare a dam project at the level of the Kongou Falls, in Ivindo National Park. The park contains the finest network of rivers and waterfalls in Africa in a forested area, in particular Kongou Falls, and associated biodiversity that is unique in many ways (Simonet, 2007).

While the Belinga industrial iron mining case reveals the potential impacts of large mining projects, even when located outside the boundaries of protected areas, artisanal mining also poses threats (Noiraud *et al.*, 2017). Illegal gold mining in the TRIDOM landscape is commonplace; the Minkebe National Park already has suffered from this (Moukouangui Moukala, 2021). Although the government of Gabon is trying to formalize and legalize this sector, much remains to be done (see box on this topic in section 3.6).

3.4.4 DRC

As previously noted, DRC is “the” mining country in the subregion. Currently, 194 claims overlap protected areas, covering almost 14,000 km²; these claims affect 3.1% of protected area land (Table 2). However, unlike Cameroon, these figures have been decreasing for several years. In 2017, overlaps affected about 11% of protected areas (Noiraud *et al.*, 2017).

DRC’s economy is more heavily dependent on mining than any other country in the subregion, which can have dramatic social and environmental consequences. The exploitation of minerals is fueling serious social conflicts, particularly in the eastern part of the country (Reed & Miranda, 2007; De Failly, 2013; AMDC, 2017). Artisanal mining is developing extensively across the country’s territory, inside and outside protected areas, with extremely limited possibilities for control. The environmental consequences are more damaging in the absence of any regulation.

Numerous mining exploration claims have been awarded around and within protected areas, such as the Okapi Wildlife Reserve and the national parks of Upemba, Virunga, and Maiko, among others; several of these protected areas are on the list of World Heritage sites. In Katanga, where copper and cobalt mining is the main industrial activity, mining claims cover a large part of protected areas, such as the Basse-Kondo game reserve and the Lufira Biosphere Reserve (Noiraud *et al.*, 2017). The high concentration of mining companies leads to significant degradation of soils and ecosystems (savannas, dry forests, hydrographic network) and even to the loss of agricultural land. In some cases, this mining also is leading to significant human health problems (Kahilu Mutshima *et al.*, 2015).

Quite recently, NGOs strongly denounced the government’s desire to downgrade part of Virunga and Salonga National Parks – listed as World Heritage sites – in favor of oil exploitation (Mupfuni & Malungu, 2018). However, it is not only the oil industry that poses threats to protected areas (see section 3.1.2), but also the mining industry, particularly for gold, coltan and cassiterite. The NGOs fear



the devastating impacts of such a decision on the rich biological and cultural diversity of these parks.

The two protected areas most impacted (directly and indirectly) by mining claims are Kahuzi-Biega National Park (a World Heritage Site) and Itombwe Nature Reserve in South Kivu. The latter contains the largest area of dense mountain rainforest in Africa. In the first case, the company *Société Aurifère du Kivu et du Maniema* (SAKIMA) held mining claims for various minerals (gold, silver, tin, niobium, tantalum, tungsten) that expired in 2016 and 2017; however, these permits are still active on the mining registry site (Cadastre minier, 2020).

The situation in the Itombwe reserve is more problematic, with two large active mining sites (Twangiza and Namoya) operated by the Canadian company Banro, as well as several prospecting permits held by various companies, the most important of which also are those of Banro (gold, copper, tin, tantalum, niobium, cobalt, etc.; Banro Corporation, 2016; Noiraud *et al.*, 2017; Cadastre minier, 2020). In addition, people from rural areas are pouring into the area (WWF, 2013), succumbing to the lure of gold and cassiterite mining on former SOMINKI (*Société Minière et Industrielle du Kivu*) company sites. Security questions also are being raised due to the presence of armed groups who alternate between illegal mineral purchases and taxation and poaching (De Failly, 2013). The volatile security climate has forced Banro to cease operations several times (Anon., 2019b).

3.5 Overlap between extraction permits and intact forest landscapes

In addition to formal conservation through the creation of protected areas, the Intact Forest Landscape (IFL) concept has recently emerged in the conservation sector to designate a geographical unit with little disturbance whose protection appears to be absolutely necessary to maintain a forest's essential functions and services. An IFL is defined as being free of significant human activity or any sign of human-induced habitat fragmentation. This type of landscape must also be large enough (with an area of at least 500km² and a minimum diameter of 10km) to contain and sustain natural biotopes and viable populations of a wide range of taxa, as well as the ecological processes necessary for the evolution of biodiversity (Thies *et al.*, 2011).

Alongside protected areas, IFLs therefore appear to be an interesting tool to analyze forest cover (Potapov *et al.*, 2017). The emergence of the IFL concept and its technical definition respond to the need to define, implement and monitor policies related to landscape change and fragmentation at regional and global levels.

The total area of IFLs was estimated at nearly 840,000km² in 2016, or 15.6% of the surface area of Central Africa (Table 3). Only six of the Congo Basin countries hold IFLs: Cameroon, Congo, Gabon, Equatorial Guinea, CAR and DRC; the latter country alone accounting for over 70% of the IFLs in the subregion (Figure 10).

Table 3 - Intact forest landscapes in Central Africa (2016)

Territory	Country's surface area (km ²)	Intact Forest Landscape	
		Area (km ²)	% land area
Cameroon	466,040	35,612	7.6
Congo	341,732	106,475	31.2
Gabon	264,550	80,529	30.4
Equatorial Guinea	26,959	2,139	7.9
CAR	620,200	4,940	0.8
DCR	2,329,128	608,851	26.1
Central Africa	5,388,201	838,546	15.6

Note: Burundi, Rwanda, Sao Tome and Principe and Chad do not contain any IFLs (dense forests). Source: WWF-SIGHT

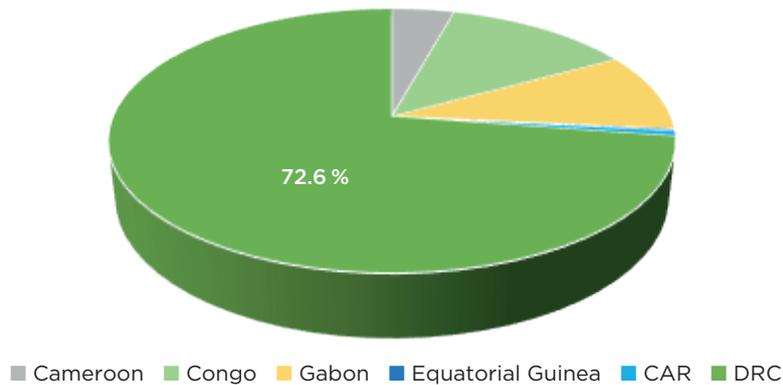
These intact forest landscapes include only dense evergreen or semi-deciduous rainforests; dry forests and tree savannas are not represented. Two major

IFL areas are located in the following regions: 1) the Congo Basin, from the eastern foothills to the swamp and flood forests of the center of the basin (including

large areas of peatland), 2) the TRIDOM region, on the borders of Cameroon, Gabon and Congo. Another IFL region covers the highlands of central Gabon, from the Chaillu Mountains to the Crystal Mountains (Figure 10). The region consists of the

hills bordering the Atlantic coast, from South Congo to Cameroon; the IFLs are very fragmented here. The IFLs in the Congo Basin cover certain protected areas and production forests, at least in part.

Figure 10 - Country distribution of intact forest landscapes in Central Africa



Source: WWF-SIGHT

The status of the oil and gas contracts overlapping IFLs is presented in Figure 11 and Table 4. Currently, 88 onshore oil and gas contracts overlap over 17% of the total area of Central African IFLs. Nearly 105,000 km² of IFLs are thus covered by industry in DRC, and more than 36,000 km² in Congo, in the center of the Congo Basin. These claims directly threaten fragile ecosystems such as swamp and flood forests and the largest tracts of tropical forest peatlands in the world (Dargie *et al.*, 2019).

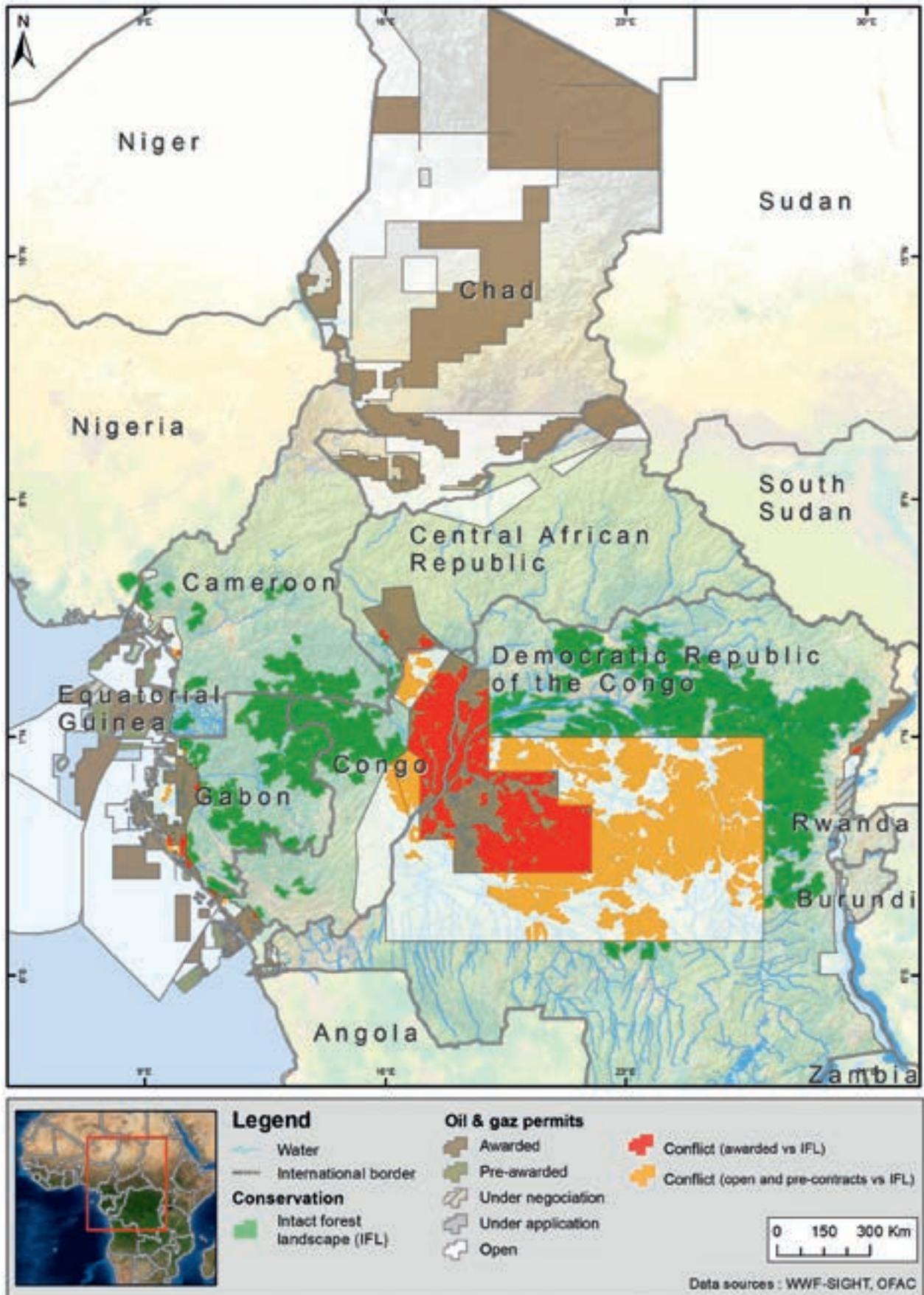
If open concessions and those in the process of being granted are added to these figures, these combined concessions occupy more than 50% of the

territories hosting IFLs (Table 4 and Figure 12). The highest rates of overlap are found in DRC and Congo (57-58%); DRC also has the highest number of contracts awaiting allocation, clearly indicating the country's economic choices in favor of extractive industries. Moreover, the area of oil and gas claims which extend over protected areas has increased from 221,467 km² to 422,787 km² since 2018 (Grantham & Tibaldeschi, 2018), meaning it has nearly doubled in just a few years. Due to the potential negative environmental impacts that may occur if the projects go ahead, concerns about these choices therefore appear justified.





Figure 11 - Spatial distribution of oil and gas claims overlapping IFLs



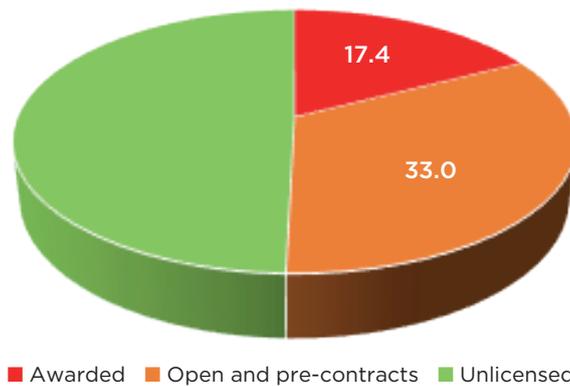
Source: WWF-SIGHT

Table 4 - Oil and gas claims overlapping IFLs

Territory	Type of claim	Claims overlapping IFL		IFL impacted
		Number	Area (km ²)	% area
Cameroon	Awarded	1	81	0.2
	Open and pre-contracts	4	610	1.7
Congo	Awarded	14	36,326	34.1
	Open and pre-contracts	13	24,262	22.8
Gabon	Awarded	16	2,492	3.1
	Open and pre-contracts	10	1,860	2.3
Equatorial Guinea	Awarded	0	0	0
	Open and pre-contracts	0	0	0
CAR	Awarded	4	2,383	48.2
	Open and pre-contracts	0	0	0
DRC	Awarded	53	104,734	17.2
	Open and pre-contracts	152	250,039	41.1
Central Africa	Awarded	88	146,016	17.4
	Open and pre-contracts	179	276,771	33.0

Source: WWF-SIGHT

Figure 12 - Proportion of IFLs impacted by oil and gas claims (%)



Awarded: operated (exploration and exploitation); Open and pre-contracts: under negotiation, pre-award, application, open. Unlicensed: no oil or gas contract. Source: WWF-SIGHT

Figure 13 - Spatial distribution of mining claims overlapping IFLs

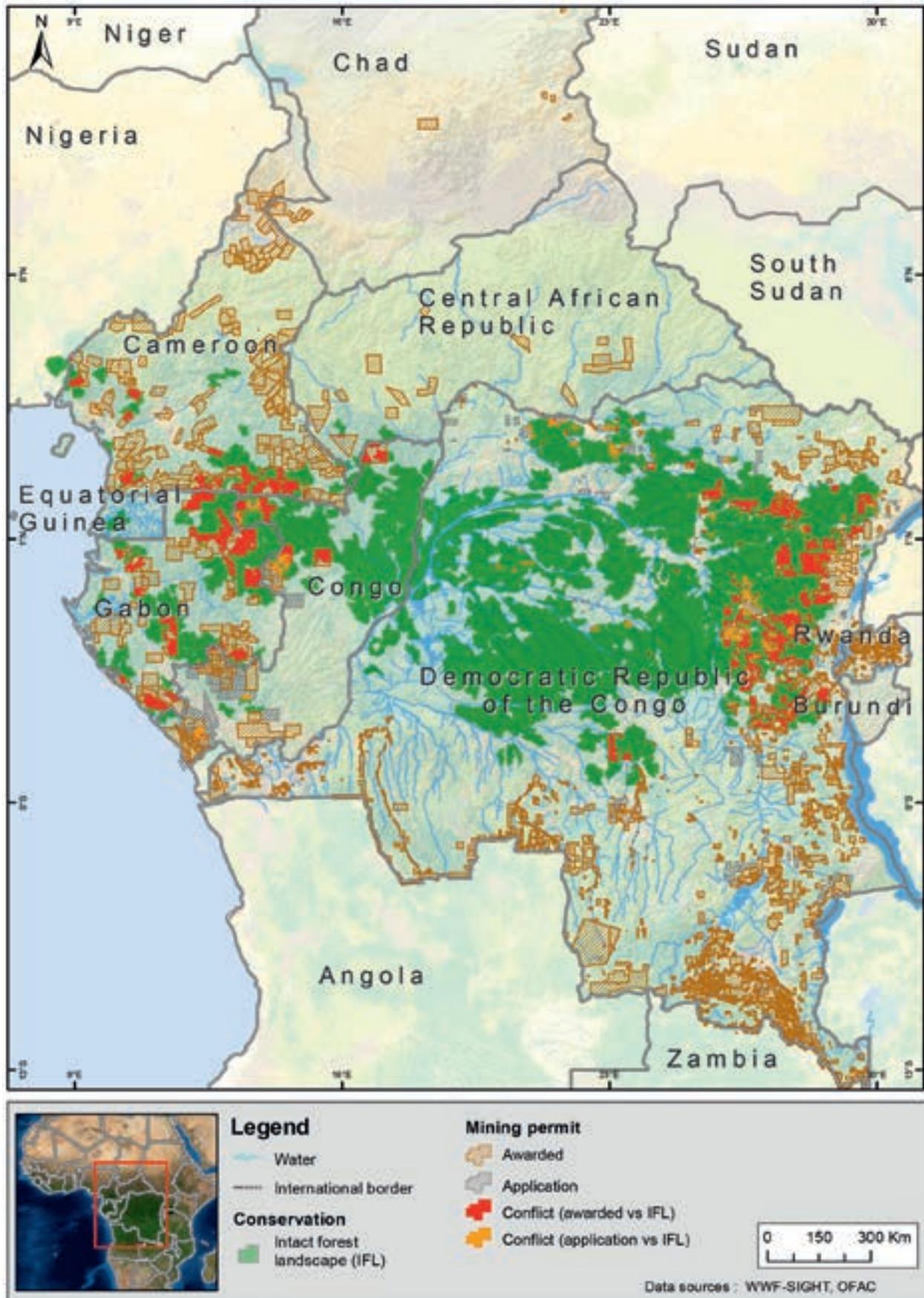
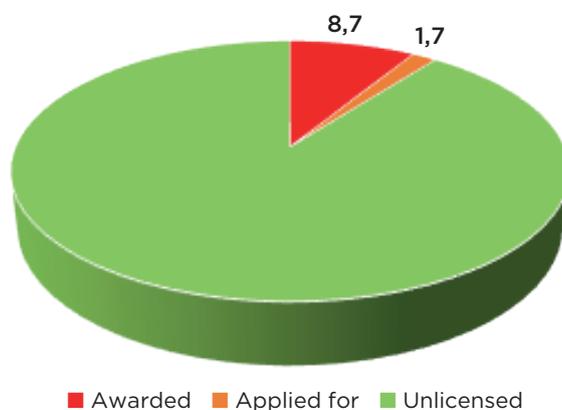


Table 5 - Mining claims overlapping IFLs

Territory	Type of claim	Area of claims overlapping IFLs (km ²)	IFLs impacted (% area)
Cameroon	Awarded	10,702	30.1
	Applied for	0	0
Congo	Awarded	9,565	9.0
	Applied for	5,644	5.3
Gabon	Awarded	21,411	26.6
	Applied for	0	0
Equatorial Guinea	Awarded	0	0
	Applied for	0	0
CAR	Awarded	20	0.4
	Applied for	0	0
DRC	Awarded	31,518	5.2
	Applied for	8,740	1.4
Central Africa	Awarded	73,216	8.7
	Applied for	14,384	1.7

Source: WWF-SIGHT

Figure 14 - Proportion of IFLs impacted by mining claims (%)



Source: WWF-SIGHT

Mining titles officially granted to operators cover just under 9% of IFLs, over an area of about 73,000km² (Table 5 and Figure 13). The situation obviously differs from one country to another, with DRC having nearly half of the overlap (in terms of surface area allocated). Cameroon and Gabon have the highest percentages of overlap, at 30% and 27% of IFLs, respectively (Table 5). When permits applied for are added to those already allocated, the total overlap reaches just over 10% of IFLs.

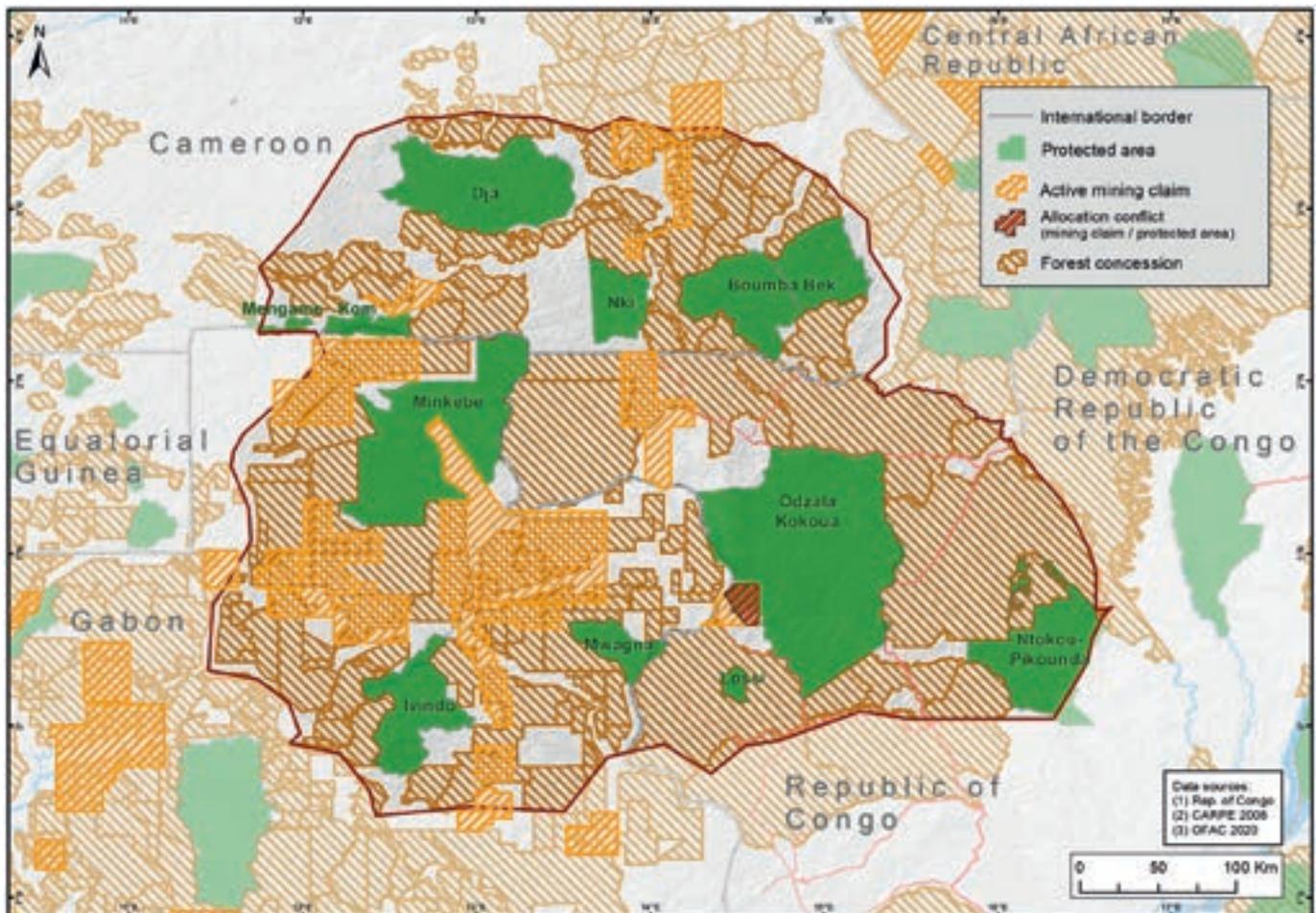
These figures are well below those for oil and gas claims (Figures 12 and 14), which may indicate a more favorable situation. Moreover, the areas involved have decreased in just a few years from 138,781 km² in 2018 (Grantham & Tibaldeschi, 2018) to 87,600km² in 2020. However, these figures should be interpreted with caution as they reflect the situation of official claims, but do not capture the situation of illegal mining. As we have seen previously, illegal mining can be widespread in certain regions (Eastern DRC, TRIDOM, etc.).

Mining claims overlap only marginally with oil and gas contracts; when added up, the total area affected by extraction permits actually reaches more than 60% of IFLs. While oil claims could, in some cases, be managed to limit environmental impacts (Dallmeier *et al.*, 2006; Moussotsi Ikapi, 2016), there is considerable concern that this will not be the case in the Central Congo Basin or with mining claims. Certain up-and-coming oil companies may be less sensitive to environmental issues than some of the sector's leading players, and the risks of pollution are higher in wetland areas (Ite *et al.*, 2013; Le Bec, 2020a). Furthermore, much of the mining sector operates illegally and is largely unconcerned by the environmental and social impacts of extraction activities (Le Billon & Hocquard, 2007; Edwards *et al.*, 2014; Lopez

et al., 2017). The danger of deforestation and forest degradation remains very high.

Lastly, comparing extraction claims with IFLs as a whole is not sufficient because Central African forests are far from homogeneous, with some containing above-average biological richness or rare and endangered species. These forests are indeed very diverse, both in terms of plant and animal composition and functional composition (Fayole *et al.*, 2014; Gond *et al.*, 2016; Marshall *et al.*, 2021). The regions most impacted by mining claims, such as eastern DRC and the Gabon-Cameroon region, are also the richest in biodiversity among Central African forests, and hold many endemic species (Edwards *et al.*, 2014; Dagallier *et al.*, 2019). The environmental impacts of mining activities may be more damaging in these regions than in some of the Congo Basin's terra firma forests.

Figure 14 - Overlap between mining, logging and protected areas in the TRIDOM landscape



Sources: OFAC and WWF-SIGHT.

3.6 TRIDOM forest landscape

The TRIDOM landscape (183,500 km²; Figure 14) is characterized by its rich biological diversity, with the largest forest elephant populations in Central Africa, low fragmentation and very low disturbance. IFLs cover 97% of the entire landscape. TRIDOM is known to be an important reservoir of iron ore, which is found in Cameroon, Gabon and Congo.

Exploratory work has shown that TRIDOM contains large amounts of high-quality iron ore deposits. It is only a matter of time before they are developed. Two major resource corridors are in sight: 1) a corridor linking the port of Lolabe (south of Kribi), via a 550 km railway to the Mbalam deposit (Cameroon) and a 70 km extension to Nabeba (Congo); 2) a large corridor that should link the Belinga deposit (Gabon) to the Gabonese coast. However, due to low market prices, the Mbalam-Nabeba project has not yet started; the governments of Cameroon and Congo are seeking buyers to replace the Australian company Sundance Resources (Mbodiam, 2021). The government of Cameroon also is seeking to raise funds for the railway, which will open up the south of the country to industrial activities, as the deepwater port south of Kribi already is operational, having been built with funding from China.

The cumulative impacts of the TRIDOM iron and gold deposits could be very significant. A coordinated mine-conservation-development approach is needed to plan measures for the survival of the complex as an interconnected landscape and to guide development activities. The major mining projects that have been initiated there are currently dormant. However, if these projects were implemented, the environmental and social impacts would be considerable, especially if the direct impacts of mining are added to those linked to the construction of transport infrastructure and to the significant flows of migrants seeking jobs and other economic opportunities. These negative impacts, if not properly managed and mitigated, are likely to threaten the very existence of this important landscape (WWF, 2018).

It is likely, however, that some large mining projects will apply the performance standards of the IFC, part of the World Bank Group; in particular

Performance Standard 6 on biodiversity conservation and sustainable management of living natural resources (IFC, 2012). If the projects are partly financed by banks that adhere to the Equator Principles, this will be a requirement. These IFC standards highlight in particular the importance of habitats that are “critical” due to their high value in protecting rare or endangered species and ecosystems. Mining must avoid these habitats or can only operate in them under very specific conditions. TRIDOM and a major portion of the forests of Central Africa meet the definition of critical habitats because they contain threatened species (forest elephants, great apes, etc.) and because they are large-scale ecosystems associated with key evolutionary processes.

The iron ore mining project that was to be operated by Sundance Resources included a biodiversity offset through the conversion of Forest Management Unit (FMU) 10-034, located in the Ngoyla-Mintom forest in Cameroon, into a protected area. This FMU became the Ngoyla Wildlife Reserve in 2014 (Decree n° 2014/2383/PM). The project also included an offset of 2,000 km² in the TRIDOM interzone in Congo to strengthen conservation efforts between Minkebe National Park in Gabon and Odzala-Kokoua National Park in Congo. The project also was meant to provide support for anti-poaching activities. All this is on hold while waiting for new mining operators.

Mining development in TRIDOM will lead to immigration and the creation of new towns around the future mining sites (Nabeba, Avima, Mbalam, Belinga, etc.). These impacts could, in theory, be limited by the mining operation through a staff rotation system (fly in, fly out). Only the workers would be able to reside on the production sites while their families would remain in town (Yaounde, Brazzaville, Mintom, etc.).

Once the deposit is exhausted, it will be necessary to restore the site (as much as possible, as mountains of iron will be extracted) and to prevent new towns from being established in a formerly uninhabited area, as is the case with Avima Mountain in the far northwest of Congo. The development actions carried out by the mining project will focus on existing towns and villages, and not on a pioneer town with inhabitants coming from all over the world. In the present case, the question is mainly hypothetical since the projects,

after an exploratory phase, have not really started, providing a grace period to the rich natural resources of the landscape in the three countries concerned.

Artisanal gold panning is another important mining activity in the TRIDOM region. Several thousand people are engaged in gold panning or related activities (working as porters, gold buyers and

small traders). Gold mining sites often are located deep in the forest and can have a significant impact on biodiversity, particularly the hunting of wildlife that thus far have been left relatively undisturbed. The supply chains serving mines are often used to transport bushmeat and ivory. The mining camps sometimes shelter poachers and/or ivory traders.

TRIDOM and TNS are under threat from artisanal and semi-industrial mining

The TRIDOM and Sangha Tri-National (TNS) transboundary complexes are under enormous pressure from illegal artisanal miners. In the southern part of the buffer zone of the Cameroon segment of TNS, three artisanal gold mining sites have been established and are operating with impunity. Similarly, illegal artisanal diamond mining is developing in the northern sector of the buffer zone of the CAR segment of TNS.

There also is considerable artisanal gold mining in the TRIDOM interzone in Congo, between the protected areas. It seems to have decreased in Gabon (Minkébé and periphery) following forceful action by the government. The area most affected is the Dja Faunal Reserve. The area around Ngoyla in Cameroon also has about 22 artisanal gold mining sites.

A new, semi-industrial gold mining sector, often involving Chinese operators, is furthermore rapidly devastating large areas of land, mining gold in an uncontrolled manner (and removing the gold that was the livelihood of artisanal gold miners) and heavily polluting rivers and springs. Despite government commitments to clean up the sector, a human and ecological disaster is underway.

The environmental impacts of these illegal practices are disastrous. They range from erosion to the diversion of watercourses through siltation (Tieguhong *et al.*, 2009). This activity generates several impacts, including deforestation and forest degradation, ecosystem pollution, poaching and fragmentation of wildlife habitats, alongside a deterioration in the living and working conditions of the gold miners.

Artisanal and semi-industrial gold mining needs to be effectively regulated and legalized to end the poaching associated with these mining sites and reduce pollution. This is particularly true of mercury pollution, the effects of which on human and ecosystem health in the TRIDOM cannot currently be assessed. It is also a question of encouraging and reserving gold mining activities for national citizens, under the framework of a reorganization of the gold sales channels controlled by the States.

In Gabon, the *Société Équatoriale des Mines* (SEM), plans to support the creation of gold miner cooperatives. This state-owned enterprise was established a few years ago to oversee the development of the mining sector and manage government holdings in mining projects. SEM plans to assist, train and equip gold miners so that they can engage in an activity that will enable them to generate income over an extended period of time (Ondo Nzuey, 2019). If this initiative becomes a reality, it could make it possible to formalize this activity to a certain extent, and to integrate consideration of environmental concerns. However, if implemented, this experiment should be evaluated and its potential for extension to other areas examined.



The largest camp was the Minkebe gold camp in Gabon, which grew to hold 6,000 people before it was evacuated by the Gabonese army. The closure of this site in 2011 accelerated the opening of other sites on both sides of the Cameroon-Congo border. Several gold mining sites currently are active in Djoum, Mintom, Ngoyla and elsewhere. The survey conducted in some of these sites found that the gold miners came from across Cameroon but also from countries like CAR and Mali (Messina & Feintrenie, 2014).

All these activities have a significant impact on the environment and pose a threat to biodiversity conservation. Gold miners do not restore sites after extraction because, they say, “nature always finds a balance in the end”. Nearly 90% of gold miners are unaware of the impact of their activities on the environment, even though the damage is sometimes quite visible, such as the blocking and disappearance of waterways.

A worrying and fairly recent phenomenon in the Congolese part of TRIDOM, in particular, concerns the emergence of semi-industrial gold mining by mainly Chinese operators. This activity results in significant pollution of waterways, and there are concerns about widespread long-term mercury pollution. These gold mines are furthermore rapidly removing the ore on which artisanal gold miners depend. These mining operations are carried out without prior impact studies and in locations close to protected areas.

4. Extractive industries and protected areas: is reconciliation possible?

This section explores the potential for extractive industries and biodiversity conservation to coexist in a mutually beneficial manner through the protection and sustainable use of biological resources in protected areas. The task is to see how the needs of economic development may be reconciled with those of environmental protection within a sustainable development approach.

Readers may wish to also consult the extensive literature on the oil and mining sectors and on improving their governance and extraction activities. Of note are several documents specifically addressing interactions between extractive industries, natural ecosystems and biodiversity conservation, which include a number of recommendations that remain valid today (Reed & Miranda, 2007; Schwartz *et al.*, 2012; Noiraud *et al.*, 2017).

4.1 Organizing and supporting the artisanal mining sector

A flourishing artisanal mining sector has developed illegally in nearly every country in Central Africa. Artisanal miners move into the forests, and often into protected areas, without authorization. They operate with impunity and cause significant environmental damage for which they are not held

accountable. Illegal artisanal mining thus has been identified as an important factor behind deforestation and “defaunation”. It often is suspected of being involved in all kinds of trafficking, including that of ivory.

The case of TRIDOM, described in a box in this chapter, is a good example. In 2011, the government of Gabon summoned up the courage to expel from Minkebe National Park several thousand illegal gold miners whose very presence was threatening the survival of this protected area. However, repression is clearly not the only way to clean up the mining industry.

The first crucial step to improving this situation is the establishment of a legal framework that formalizes and rigorously controls the activity. This will ensure that those operating illegally inside protected areas are put out of action, and that those operating outside protected areas respect environmental and social standards. The ultimate goals are to reduce environmental impacts, improve the living conditions and earnings of miners, and ensure that national economies receive their due.

Various initiatives to improve governance and support the organization of the artisanal sector have been undertaken in recent years (Noiraud *et al.*, 2017; Ondo Nzuey, 2019). These include the establishment of dialogue platforms (particularly in DRC, with the support of GIZ, the German Agency for International Cooperation) and cooperatives. These initiatives highlight a global approach to mining issues, dialogue between stakeholders, better transparency in the sector and even joint decision-making. They should be pursued and adapted according to the specific contexts of each country and territorial level.

To do so, artisanal miners need to be accompanied and trained in less destructive and more profitable practices; sometimes, it may even be necessary to start with basic training so that they can learn to read and understand documents that concern them (De Failly, 2013). An increase in the organization and empowerment of artisanal miners is needed to lay the foundations for active artisanal mining alongside industrial mining, and to limit the social and environmental impacts observed today. This also implies providing artisanal miners with technical, financial and organizational support and guidance (e.g., organization into a professional association or cooperative). All of these new tasks are challenges for the public authorities overseeing mining, but they can be supported by various NGOs or by the private sector.

To keep artisanal mining clean, claims must not be granted inside protected areas and those on the outskirts of protected areas must be supervised carefully. In effect, artisanal miners alone cannot control and prevent poaching or the trafficking of ivory and trophies by workers or traders and transporters active in these gold mining sites.

A set of measures should be discussed, decreed and respected by the gold miners, even if it means closing a gold mining site. These measures include no trafficking in ivory, trophies or bushmeat, clarification of land and exploitation rights, a ban on subcontracting quarries, a ban on the use of mercury or other polluting materials, a ban on child labor, the official sale of minerals (primarily gold) through state-controlled channels and, if possible, reserving access to certain artisanal mining activities such as gold panning to nationals only.





4.2 Include protected areas and extractive industries in land use plans

Land use planning reflects a strategic vision of sustainable development through a more or less long-term planning of the use of land and available resources (Oyono *et al.*, 2014). It is the expression of a political will to place actions (national, regional or local) in a framework of spatial coherence. It is above all a deliberate public policy to try to act on the organization of space, i.e., on the relations that exist between the functioning of human economic and social systems and the structure of the space in which these systems operate.

With this in mind, it is important that extractive resources should not be explored or exploited on an ad hoc basis, but rather be subject to prior land use planning, which must be rigorously respected, and to the establishment of a framework for consultation and dialogue between the users of the land and its resources. This framework helps to prevent and manage potential land use conflicts. Land use planning also has the merit of being able to improve cooperation between sectors, and to provide a lasting solution to conflicting sets of rules, particularly between laws governing mining and those governing environmental protection and the management of protected areas.

For example, on the initiative and with the support of GIZ, a dialogue platform was created in the mining province of Katanga (DRC) named IDAK (Sustainable investment in Katanga). This platform aims to facilitate permanent dialogue

between the public sector (provincial government, devolved administrations and decentralized administrations), the private sector (mining companies of all sizes and all sectors, federations or unions of artisanal cooperatives) and civil society. The platform is proving to be effective in terms of multi-stakeholder consultation, but is struggling to generate alone enough concrete and visible action on the ground (Noiraud *et al.*, 2017).

This intersectoral consultation must be effective both at the level of field decisions (at the level of the province, as in Katanga, or at the level of management units such as the Technical Operational Units, or UTOs, in Cameroon) but also at the level of the countries as a whole or even between countries. These consultations are necessary so that decisions can be taken at various decision-making levels that are shared and accepted by everyone involved. This must also be accompanied by the establishment of a transparent monitoring-evaluation-sanction system to ensure that decisions are implemented.

Consultation between stakeholders can be organized through more or less formal meetings or more informal discussions. It also can use tools for dialogue and the joint analysis of actions, such as role-playing. These can also be combined with modeling tools to highlight the consequences of decision-making, such as the MineSet tool. This array of dialogue and forecasting tools can not only help government departments, but also all mining sector stakeholders to interact with those in other sectors, including the environment, conservation and biodiversity management.

MineSet - Promoting consultation and decision-making on mining projects

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MineSet is a decision-support tool designed to facilitate consultation between different stakeholders concerned by the social and environmental impacts of mining projects in tropical forests (Redpath *et al.*, 2018). This tool was developed under the CoForSet project, which focused on ecological compensation schemes for extractive activities and the environmental impacts of these mechanisms (<https://www.cofortips.org/>).

MineSet is a board game where the dynamics of forestry, infrastructure and mining industries develop according to the decisions taken by the players, who manage forestry and mining concessions or protected areas. They discuss, negotiate, forge alliances and/or enter into conflict. Their decisions have environmental, social and economic consequences that are directly visible on the game board. Being able to visualize the direct, indirect and cumulative impacts of players' decisions often reveals to the players the unexpected consequences of their decisions, which may be more or less acceptable from an environmental and social perspective. Players can then review their initial strategy and re-examine the consequences of different individual or group actions.

As this "serious" game is quite flexible, it can easily be adapted to different contexts, including protected areas. It has been used successfully by the Forest Stewardship Council (FSC) in Central Africa to define regional indicators related to the management of intact forest landscapes within forest concessions. The negotiation process had been stalled by differences of opinion and misunderstanding between the social, environmental and economic chambers of the FSC. By exchanging roles, participants were able to better understand each other's concerns and return to the negotiating table to reach a consensus on a set of indicators.

This type of tool, when used with an experienced facilitator, is an excellent means for defusing conflicts, exploring strategies and developing scenarios before turning to formal discussions, and these discussions should prove to be better informed thanks to the experience acquired through the board game.

Most Central African countries are now part of this land use planning dynamic, even if they are not all at the same level of land use planning or development. They have recognized that there can be no sustainable development without designing and implementing land use plans.

For example, like many countries in the sub-region, Cameroon has a master plan for land use and sustainable development. This document presents the orientations, objectives and expected results of a spatial, physical and environmental development vision. It is based on policy options, available natural resources, social dynamics, and the country's environmental, artistic and cultural heritage. This national plan is gradually being broken down into regional plans.

The conservation of natural wealth requires a territorial approach based on management at the scale of large landscapes that span entire complexes of protected areas and other areas under sustainable management. This approach is supported by the Central African Forests Commission (COMIFAC) and is being implemented in some countries through multi-stakeholder territory projects (such as the UTOs in Cameroon). In these landscapes, efforts must be grounded on the compatibility between different development sectors and between the different landscape and ecosystem spaces which host and surround the protected areas. This means taking into account the influence of every activity, looking beyond the exploitation and conservation sites alone,



and including the transportation routes of extracted commodities and assorted infrastructure (Reed & Miranda, 2007). This also means considering the overlapping of different uses when this is possible, as well as their spatial separation when not (zoning of the territory). Such a landscape level management approach must outline in detail management issues and objectives. It also must facilitate the emergence of a long-term vision and serve as a tool for understanding, guiding and monitoring the implementation of actions to be carried out in a concerted manner within these landscapes.

4.3 Exclude or strongly regulate oil and mining exploration and exploitation in protected areas

In protected areas, biodiversity conservation objectives take precedence over other management objectives. These may at times accommodate certain activities (possible overlapping of uses) or exclude them completely (separation of uses). For example, extractive activities are not permitted in International Union for Conservation of Nature (IUCN) Category I (strict nature reserves) or II (national parks) protected areas (Dudley, 2013). Many of the laws governing the management of Central African protected areas exclude human and industrial activities within these spaces.

In practice, however, these laws do not seem to apply to extractive activities (De Souza, 2019). There often is a strong temptation to downgrade protected areas for oil or mining and ignore their conservation objectives (Qin *et al.*, 2019). Various projects, such as oil exploitation in Virunga National Park (DRC), have been highly controversial and were eventually suspended; however, recurrent pressure from political-economic elites continues to be felt (Mupfuni & Malungu, 2018). Further south, the Itombwe Nature Reserve is still under attack from mining – both industrial and artisanal – and under pressure from exploration permits.

While exploitation operations may not seem compatible with protected areas, experience has shown that in some cases, when an oil company actually applies the most recent laws and operating standards, its environmental impacts can be controlled and its social impacts can be improved (Moussotsi Ikapi, 2016). IUCN protected area categories IV (habitat/species management area), V (protected landscape/seascape) and VI (protected area with sustainable use of natural resources) can accommodate economic activities provided that these activities are compatible with the primary objective of ecosystem and species conservation. This implies that the management of the extractive activity should be designed with a strict application of the avoid-reduce-offset sequence, and that the extractive

activity would be closely monitored and even terminated in case of non-compliance. In Central Africa, all these conditions are still far from being met and the precautionary principle must prevail: no exploration or exploitation operations in protected areas until these are proven safe.

These situations illustrate the fragility of the laws governing the management of biodiversity and the weakness of their application in the face of pressure from political and economic elites. They also reflect a lack of intersectoral consultation and incoherent national laws. Ultimately, a profound change in the system of governance and management of extractive industries is needed, meaning a shift from a profit-capture model to a cost-sharing and benefit-sharing model (Rosellini, 2005). Some progress clearly has been made (mining cadastres, participation in EITI by certain countries, etc.), but not enough to ensure transparency, controlled risk management and social equity in the governance of the extractive industries in the subregion.

It therefore seems necessary, within the framework of governmental consultation, to ensure that a ban on human activities, including industrial operations, be reaffirmed and strictly respected in category I to III protected areas, and that the principle of subordination to conservation objectives prevail in category IV

to VI protected areas. In addition, the activities that are allowed on the outskirts of protected areas must be strictly monitored to prevent and limit environmental and social damage.

4.4 Changing how protected areas are perceived

Protected areas are widely perceived by some people in Central Africa as spaces that unnecessarily exclude human activities and do not generate any benefits for the communities living within or near them. Their importance in terms of providing free environmental services, combating the effects of climate change, and even developing sustainable economic sectors is insufficiently recognized by decision-makers at all levels (see, for example, Dudley & Stolton, 2010; Stolton *et al.*, 2015; chapters 8 and 9 of this book). Protected areas are then viewed as a source of frustration and are created only to satisfy the expectations of development partners.

With a few exceptions, governments therefore invest very little financial or human resources in protected area management. Too often, these areas are left to their own devices, vulnerable to poaching and trafficking of various kinds. And when these areas can offer immediate economic benefits, via other types of



uses such as extractive industries, which are directly accessible to political-economic elites, then the temptation to downgrade them is great (Qin *et al.*, 2019).

On the other hand, even when protected areas generate economic activities, local populations rarely enjoy the benefits. In general, a better redistribution of the benefits derived from these protected areas must be made systematic. This is the case in Rwanda, where Volcano, Akagera and Nyungwe National Parks bring in substantial foreign exchange and employ numerous people in management and tourism activities. Nyungwe Park, for example, is rich in gold, but mining is prohibited in favor of biodiversity conservation, ecosystem services (protection against erosion, maintenance of the microclimate and water supply for agriculture) and tourism.

The interface between industrial concessions and protected areas in the same landscape is currently marked by a lack of information exchange, communication, consultation and openness to participation. Actors and policy makers themselves often have little knowledge of the potential for sustainable and inclusive development of the different territories that make up the landscapes. They generally have little knowledge of the economic value of possible synergies between production and conservation areas due to the poor dissemination of conservation texts and to a lack of information flows between institutional actors and private sector operators.

In order to combat this misperception of protected areas by private sector companies and local communities, and therefore the lack of attention paid to them at the political level, knowledge must be better disseminated in society. Environmental education and information, professional training on biodiversity and its importance (supply of products and services to human societies), must be developed. In the forestry sector, the incorporation of new knowledge has made it possible to promote sustainable exploitation with dual environmental and socioeconomic benefits. There could be lessons to be learned from this for the extractive industries sector; the environmental and social aspects of mineral exploitation, and relationships with other sectors (including conservation), need to be better integrated and developed in professional curricula.

The viability of protected areas therefore will depend on local communities, operators and

decision-makers becoming aware of the important benefits provided by these areas, the quality of their management and the economic and social benefits they can generate. Governments would be less likely to downgrade protected areas if they were convinced that they could contribute to national and local development. Protected areas also would have the support of local and indigenous communities who would see them as a tool to fight poverty.

However, this is not enough. It must be clearly stated that protected areas are not the source of rural poverty, nor are they able to resolve all problems. These are largely due to the lack of a fair redistribution of benefits gained from extractive industries, which are the main sources of wealth in most countries.

4.5 Integrating environmental concerns into the management of extractive industries

Broadly speaking, oil and mining projects in Central Africa are theoretically subject to environmental regulations, with requirements for preliminary environmental and social impact studies, accompanied by an environmental and social management plan. The avoid-reduce-offset approach is supposed to be applied at all levels of mining projects (see section 1 of this chapter). However, the weakness of governance in most countries of the subregion is not always conducive to the rigorous application of these legal and regulatory provisions. It is essential that this situation be remedied. First, all countries must join or re-join EITI and submit comprehensive reports on a regular basis.

Second, in addition to legal requirements, which often fall short of international standards, extractive industries must be part of a sustained improvement dynamic in the field, and internalize good practices with regard to taking biodiversity into account in their operations. They must comply with IFC standards and the Equator Principles. Supported by IUCN, the International Council on Mining and Metals (ICMM) also has developed a practical guide for extractive industries (ICMM, 2006). This guide, as its name suggests, provides mining operators with a set of tools, approaches and requirements that can help them minimize their footprint on biodiversity and thus improve their credibility with investors

and other stakeholders. This guide, which should be updated with regard to recent technological developments in the mining sector, could also inspire reforms of laws governing the exploration and exploitation of mines and metals.

The real challenge facing Central African countries is the need to conciliate a desire to promote economic development on the one hand with the preservation of the region's rich ecological and human heritage on the other. Governments must promote proactive policies that integrate environmental and social concerns into all extractive activities in order to encourage mining operations that truly contribute to the sustainable development of their countries. This also means that both effective incentive systems and credible control and penalty systems must be put in place.

4.6 Promoting public-private partnerships for biodiversity conservation

As noted above, the nature of extractive industries' operations can have very significant impacts on biodiversity and the environment overall. Through environmental management plans based on environmental and social impact studies, extractive industries commit to preventing, minimizing and repairing the damage they may cause to the environment during their operations (the avoid-reduce-offset sequence). Despite their possible willingness to do so, mining and oil companies do not always have either the capacity or experience to contribute to biodiversity conservation to an extent that could offset the negative impacts they may create.

It is therefore important to examine the possibility of promoting partnerships between extractive industries, governments and NGOs or private partners working in the field of conservation. This is the case of traditional organizations such as WWF (World Wide Fund for Nature), IUCN and WCS (Wildlife Conservation Society), and more recently established organizations such as African Parks Network (APN). This type of Public-Private Partnership (PPP) can effectively organize the contribution of extractive industries to protected area management and biodiversity conservation efforts through alliances between different stakeholders with complementary skills and responsibilities.

The example of Shell in the Gamba protected area complex in Gabon is quite instructive in this regard (Dallmeier *et al.*, 2006; Moussotsi Ikapi, 2016).

This type of PPP also should be considered whenever a project has a significant impact on biodiversity, or indeed protected areas, and it is essential to implement compensatory measures. This is the case, for example, of the Chad-Cameroon pipeline, part of whose environmental impacts have been compensated through the establishment of a trust fund financed by the oil companies through the Cameroon Oil Transportation Company (COTCO). The funds collected notably make it possible to support the conservation of Mbam and Djerem and Campo-Ma'an National Parks through a partnership between private companies and the managers of these protected areas.

Such partnerships also could be extended to local and indigenous communities in a dynamic of broader collaboration. This would promote the transparency of the extractive industries, their optimal contribution to national economies, their societal responsibilities, the optimal management of biological resources and the protection of the environment, as well as the security of the rights and well-being of local and indigenous communities that may be impacted.

5. Conclusion

In Central Africa, although fluctuating commodity prices, particularly for oil and iron, and the Covid-19 epidemic have slowed the development of extractive industries in recent years, revenues from oil, gas and mining still form the bedrock of public finances. These industries provide the bulk of export revenues, and often have done so for several decades, as evidenced by the large number of mining, oil and gas contracts and the extent of the land which they occupy.

Extractive contracts currently cover 60% of Central Africa's protected area network and 60% of the subregion's intact forest landscapes. Moreover, oil and gas claims cover 100% of the maritime exclusive economic zones, whether or not these areas are classified as protected areas. Virtually the entire Chad Basin is covered by petroleum claims, as is the Central Congo Basin, including very fragile aquatic and

An example of compensation: the Chad-Cameroon oil pipeline project and protected areas

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The Foundation for the Environment and Development in Cameroon (FEDEC) was created in 2001 as part of the Environmental Management Plan for the Chad-Cameroon Pipeline Project. This pipeline allows oil to be transported from fields in southern Chad to Cameroon's Atlantic coast in the Kribi region. FEDEC manages a trust fund intended to pay some compensation for the project's adverse effects on the environment (ecological and social). Protected area managers and the private sector must work in partnership, led by the World Bank, the government of Cameroon and a consortium of oil companies involved in the pipeline development.

The funds are generated by compensation payments for project impacts by Exxon-Mobil, Chevron and Petronas, and made by COTCO, the company in charge of managing the pipeline. They are intended to finance the development and management of Mbam and Djerem and Campo-Ma'an National Parks, and to support sustainable agriculture and the improvement of education and health systems for the Bakola/Bagyeli indigenous peoples between Lolodorf and Kribi. COTCO has committed to financially support FEDEC for 28 years (the projected life of the pipeline) and has paid US\$6 million to date. The credibility of the actions carried out on the ground is guaranteed by the World Bank. FEDEC was recognized as a public utility in 2001 and has an agreement with MINFOF (Ministry of forests and wildlife of Cameroon), allowing it to seek other investors and to work across Cameroon in favor of the environment and biodiversity. It has obtained MINFOF's agreement to intervene in two other parks, Deng Deng and Mbere Valley. It is looking for other investors interested in investing in these two parks.

In 2017, financial contributions to the various projects amounted to FCFA 58 million for the Campo-Ma'an park (beneficiary: African Wildlife Foundation (AWF), an NGO), FCFA 78 million for the Mbam and Djerem park (beneficiary: WCS, an NGO) and FCFA 56.5 million for support to local communities. FEDEC also receives ad hoc contributions from other donors on a project funding basis, including the Canadian High Commission in Yaounde (support for rural communities) and Granby Zoo (mobilization campaign for the construction of a gorilla health laboratory, gorilla habituation and support for local communities). However, these contributions remain far below expectation, situated around 400-500 million FCFA/year per protected area to cover all of the expenses involved in implementing the management plans. A drop in the value of the US dollar, combined with difficulties in recovering investments, did not help to replenish the Foundation's coffers. This situation led FEDEC to draw from its capital in 2008, which raises the spectre that the mechanism may become unsustainable.

In this context, we note with regret that the Cameroon Government does not contribute to FEDEC's capital funds. Government participation in a trust fund would have the advantage of legitimizing the fund in the eyes of other potential donors, such as private sector companies that may be interested in biodiversity conservation. The current legal framework of FEDEC, like all trust funds operating in Cameroon today, also needs to be clarified. Legislation favoring foundations should be introduced, which would reassure potential investors.

peatland ecosystems. In addition, many of the rich and fragile ecosystems around the Central Congo Basin are in the grip of mining claims.

Their current and potential impact on biodiversity is considerable and could undermine conservation and sustainable development strategies in the subregion. While the local impact of oil wells may be relatively small, the overall direct and indirect impacts and socio-economic changes caused by extractive operations are often much larger. They must be better taken into account in all extractive projects.

Countries want to develop while reducing the environmental impact of human activities. To achieve this dual objective, human development must be decoupled from impacts on biodiversity and the physical environment, and from the indiscriminate exploitation of natural resources (Fischer-Kowalski *et al.*, 2011).

This last point requires deep societal changes leading toward more mineral-saving societies, technological innovation, and the development of alternative energy resources such as solar, hydraulic and wind energy. A country like Gabon, which is a member of OPEC (Organization of Petroleum Exporting Countries), can nonetheless be subject to purely commercial pressure from the most powerful countries in the organization, such as Saudi Arabia, to either open or close its oil taps. As we have seen, the national economy and the balance of state finances remain highly dependent on the oil sector, despite commendable attempts at economic diversification. For the sake of economic stability, but also for a more low-carbon development (contributing to the fight against climate change), it is in the country's interest to strengthen the diversification of the economy while using its oil resources sparingly.

This calls for overall policy, in particular energy policy, that is clear, stable, and consistent with sustainable development objectives, which must be explained to stakeholders. Tensions between governments, oil (and mining) companies, political partners, NGOs and civil society, all of whom have different interests at stake, must be resolved (Le Bec, 2020b). This requires: 1) the development of stakeholder consultation platforms (including representatives of protected areas and biodiversity conservation), 2) the systematization of multi-stakeholder land

planning for sustainable development, 3) the application of internationally recognized environmental and social standards, and 4) the strengthening of the transparency and governance of the extractive sector.

It is therefore imperative for States to be aware of the need to approach these extractive industries in an integrated manner, promoting local industrialization and increasing fiscal resources while meeting the aspirations of their populations and the need for the conservation and sustainable management of biological resources and the ecosystem services that they provide. This means that States should implement sustainable development policies that promote better distribution of wealth. Even if some progress can be noted, the oil and mining sector still needs to demonstrate transparency, good governance and equity in the distribution of revenues (membership in EITI, accessibility of an up-to-date mining cadastre, transparent tax and revenue declarations, etc.).

The first point mentioned above – reducing the impacts of industrial activity – is of even more direct relevance to protected areas because they are under increasing pressure from industry, as we have seen throughout this chapter. In almost all Central African countries, many mining and oil exploration and exploitation claims border or overlap large areas of protected areas and intact forest landscapes. The exploitation of these underground resources therefore threatens the rich biological diversity within and around these protected areas. However, apart from gold mining and artisanal diamond production, large-scale industrial mining is still underdeveloped in most of the subregion. It is therefore still possible to avoid the mistakes of the past and to ensure that the future development of mining is environmentally and community-friendly.

While policies and legislation have changed significantly in recent years, particularly in terms of environmental and social standards, they are not sufficiently enforced on the ground. It is up to the States to ensure that environmental and social impact studies are carried out according to international standards and that mining and oil projects systematically implement the avoid-reduce-offset sequence. The government departments involved face significant challenges, particularly in terms of strengthening their expertise in these areas and their monitoring and intervention capabilities. Public-private style



partnerships could make it possible to remedy these shortcomings and promote the reconfiguration and operational expansion of public services.

Other partnerships could also be put in place to support States in the necessary formalization of artisanal mining. Attempts to establish cooperatives have been carried out in DRC, with insufficient success to date. Gabon also wants to move in this direction, but the needs are such (training, supervision, various forms of support; De Failly, 2013; Ondo Nzuey, 2019) that the public sector must enlist partners to help meet these needs.

Throughout this chapter, we have tried to show that it is possible for these two forms of land use – extractive concessions and protected areas – to coexist on the same territory if certain conditions are met. The management of natural and other public resources must be improved, adequate land use planning and development ensured, and intersectoral cooperation encouraged in the exploitation of the resources that

the territory contains or shelters. It is also important that States make a strong commitment to prohibit mineral exploration and exploitation in protected areas, in accordance with the laws governing their management and with the international environmental agreements to which they are party. Similarly, the rigorous legal framework for mining and oil exploitation must be implemented as a priority on the outskirts of protected areas to guarantee the safeguarding and restoration of nature, as well as the well-being of local communities.

The challenges are certainly great, but a strong political will is likely to shift the tide in order to promote an economy that is more respectful of human life and societies, which will ensure economic development that integrates environmental concerns. Some countries seem to have made more progress than others. Regional coordination and the sharing of experiences and lessons learned therefore could give a regional dynamic a boost in the right direction.

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Annex 1 - Methodology for assessing the impact of extractive concessions (mining, oil and gas) on key sensitive areas (protected areas and intact forest landscapes)

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This study aims to identify and quantify the spatial overlap of extractive concessions (mining, oil and gas) with key environmentally sensitive areas (protected areas and intact forest landscapes) in Central Africa. The countries concerned include: Burundi, Cameroon, Chad, Congo, Gabon, Equatorial Guinea, CAR, DRC, Rwanda and Sao Tome and Principe.

The overlap between spatial, environmental and extractive datasets was defined using GIS analysis with the WWF-SIGHT platform developed by WWF. The coordinate system used was WGS 1984 Web Mercator Auxiliary Sphere. The layout of national borders of Central Africa were obtained from Open Stream maps.

Data defining the spatial location of mining concessions were obtained from the SNL Metals and Mining database (accessed on 02/12/2020). Data defining the spatial location of oil and gas concessions were obtained from the DrillingInfo database (accessed on 02/12/2020). Protected area locations and boundaries were defined using the IUCN/UNEP-WCMC World Database of Protected Areas (WDPA) (accessed 02/12/2020). Intact forest landscapes are those assessed in 2016.

The spatial overlap between these datasets as recorded by the GIS analysis was exported to MS Excel. The data were filtered. Any extractive activity that could be interpreted as having a limited or negligible impact on a protected area was excluded by applying the following filters:

oil and gas concessions

- exclusion of all concessions that expired before 01/12/2020. All oil and gas leases with no specified expiration date remained in the sample,
- differentiation between oil and gas concession contracts in operation (active or awarded, with a clearly identified concessionaire) and those not yet contracted, i.e., without a validated concessionaire or available for award, under bidding, pre-award or negotiation,
- deletion of all concessions closed due to force majeure;

mining concessions

- exclusion of all mining concessions that expired before 01/12/2020. All concessions with no specified expiration date remained in the sample,
- removal of all mining concessions that were neither in the process of being applied for nor awarded. The concessions awarded were differentiated from those for which the claim application is pending;

protected areas

- removal of any protected areas with a status of “Proposed” or “Not reported”, leaving only designated or listed protected areas, including international designations (World Heritage sites, Ramsar sites, biosphere reserves).

One problem we faced was the overlap of protected area surface areas where different



designations may cover the same spatial area (e.g., a national park and a World Heritage site). In addition, a single extractive concession may overlap several types of protected areas in the same zone, generating multiple records duplicating the zone where the overlaps occur. While this is an effective representation of the overlapping areas of the protected area network, it is potentially misleading and the figures cannot be directly compared to the size of the country, for example.

To solve this problem, the results take into account: 1) overlaps occurring within each protected area (keeping only one area where multiple protected area statuses overlap) and 2) overlaps occurring within concessions (keeping only one area where concession boundaries overlap).

The results were then combined to provide an assessment of the overlap of extractive activity with protected areas. Maps were generated using these filtered results.