



Extractive industries in forest landscapes: options for synergy with REDD + and development of standards in the Democratic Republic of Congo



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1. Introduction

Mining and on-shore oil and gas extraction are a major driver of deforestation in tropical forests and account for an estimated 7% of total forest loss in Africa, Latin America and Asia (Hosonuma et al., 2012). At local levels, extractive industries can be a major cause of forest loss, as observed in parts of Papua New Guinea, India's Madhya Pradesh and Guyana (Areendran et al., 2013; Laurance et al., 2012; Lowe, 2014). With high global demand, economically valuable mineral resources in remote –often forested– areas, such as the Congo Basin, are more likely to become developed. New infrastructure corridors, associated with mineral exploitation and related hydropower needs, facilitate access to previously inaccessible tropical forest areas and accelerate development and forest clearing in developing regions (Edwards et al., 2014; Weng et al., 2013). Deforestation and degradation of tropical forests contribute an estimated 14–21% of global emissions (ISU, 2015). Mitigation of impacts on forests and reduction of related emissions is the main aim of policies on Reduction of Emissions from Deforestation and forest Degradation and improving carbon stocks (REDD +). Even though most mineral rich countries that are presently developing their REDD + strategies have identified the extractive sector as a driver of deforestation, it is often not considered in related policies and actions. This paper explores options for extractives industries to contribute to REDD + objectives, using insights gained from developing REDD + Standards for extractives in the Democratic Republic of Congo. As mining is more prevalent in forest areas than oil and gas extraction, this paper focuses mainly on mining with the understanding that the underlying principles apply to the entire on-shore extractives industries.

1.1. Extractive industries and deforestation

Extractive industries and associated infrastructure are among the causes of reduction of intact forest landscapes globally, and ranked as the fourth driver after industrial logging, agricultural expansion and wildfires (Potapov et al., 2017). Even though the direct footprint from

extractive industry activities on forests can be modest, highly significant impacts on forests can become evident when considering forest landscapes and extractive industry related infrastructure. Impacts on forests can occur during all phases of operations: exploration, exploitation, processing of minerals and closure. Surface mining, which is the dominant form of mining at present, is particularly damaging to forests (Hirons, 2013b). In addition to the direct removal of forest cover, the indirect impacts of associated infrastructure (e.g. roads, mineral transport infrastructure, power facilities, hydropower dams, etc.), connecting infrastructure for other land uses, and associated immigration can be much vaster. Development of infrastructure requires direct forest clearing and opens up forest areas to new settlers and immigrants, who bring in agriculture, logging and hunting activities that further impact forests (Finer et al., 2008). Infrastructure development can furthermore cause blocked or altered water flows with impacts on forest vegetation (Laurance et al., 2009). Displacement of existing communities from new mine sites into forest areas is another example of indirect impacts from mining on forests. Mining affects wider forest landscapes by fostering economic activities that lead to further incursions into forested areas. For example, the growth of mineral production over the past decade in parts of Brazil has been associated with unprecedented growth of the agriculture sector and affected wider land-use change by driving the expansion of plantations and charcoal production (De Assis Costa, 2012; Sonter et al., 2014). Mining in forest landscapes can have an especially pernicious effect on ecosystems when they harm the biodiversity function of Protected Areas (PA). An estimated 7% of operational mines for four major metals (copper, zinc, iron and aluminum) overlapped with PA globally in 2013, threatening the global PA network (Duran et al., 2013). Even in, and near, natural World Heritage Sites (WHS), of which the importance and sensitivity of ecological landscapes are internationally recognized, there is increased extractive industries' exploration and exploitation that could harm biodiversity and ecosystem services (Turner, 2012). In 2015, over 30% of natural WHS overlapped with extractive activities (WWF, 2015).

The exact impact of Artisanal and Small-scale Mining (ASM) on

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forest landscapes is largely unknown and can be diverse, depending on whether it concerns long-term livelihood activities or a rush situation and whether effective environmental oversight is practiced. A rush situation, where large-scale in-migration takes place when rumors on the availability of a mineral resource are spread, attract large numbers of people (mostly young men) overnight that rapidly deplete forest resources in a need for food, building materials and energy. In other instances, ASM may entail a relatively small individual impact on deforestation, but the total scale and duration, together with competing land uses lead to cumulative spreading of negative impacts on forest landscapes (Hund and Megevand, 2013). In the Madre de Dios region of Peru, for example, artisanal gold mining caused massive forest loss and wider impacts on land use from mercury pollution in air and waters (Asner et al., 2013). In other forest landscapes, ASM still has a lower environmental footprint because of its limited scale and duration, with low levels of technology and processing, dispersed over a small number of sites dotted across large areas. Artisanal miners are generally also involved in other activities, such as agriculture, the collection of Non-Timber Forest Products (NTFPs), fishing and hunting, which brings additional pressure on forest resources (Ingram et al., 2011). The general lack of capacity of government services to manage and monitor ASM and it being an important livelihood activity for rural households pose challenges for reducing impacts of ASM on forests (Hirons, 2011; Schure et al., 2011).

1.2. Reducing Emissions from Deforestation and Forest Degradation (REDD+)

After recognition that deforestation and degradation of forests is a major contributor to greenhouse gas emissions, reversing this trend was considered an opportunity to mitigate climate change. The COP13 of 2007 defined REDD+ as local, subnational, national and global actions whose primary aim is to reduce emissions from deforestation and forest degradation and enhance forest carbon stocks in developing countries. An important part of the discussion on REDD+ involved offering a financial value for the carbon stored in forests by having rich countries pay for the reduction of emissions from land-use change and offering compensation to developing countries for low-carbon development strategies. Nowadays, the container term REDD+ refers to one or all of the following: the preferred outcome of reducing deforestation and degradation including various environmental and development objectives; the related policies and actions, and; the potential mechanism to finance this. The finance mechanisms focused initially on carbon markets, but so far budgets for developing REDD+ policies and first projects have mainly been obtained from development assistance. Perspectives for forest carbon markets to offer substantial contribution as a finance mechanism remain poor (Boucher, 2015). *This paper focuses primarily on the technical aim of REDD+ and practical actions involving the extractives sector to contribute to these aims.* This focus suits present needs of tackling multi- and cross-sectoral governance issues, such as in this case the interactions and contrasting interests between forest and extractives sectors, as one of the primary challenges to REDD+ (Hirons, 2014).

1.3. DRC's forests, mineral resources and REDD+

The Democratic Republic of Congo is one of the poorest countries in the world, rating 176th out of 188 countries on the Human Development Index (UNDP, 2016). At the same time, the country has abundant tropical forest reserves that comprise 60% of the Congo Basin humid forests, with roughly 152.6 million hectares of forest cover (FAO, 2016). The deforestation rate between 2004 and 2014 in the Central African region is relatively low, at an average 0.36% per year, but this rate is increasing and represents a total surface loss of 6885,000 ha over the past decade, of which 85% in the DRC (Dubiez et al., 2016). This forest loss has largely been due to agriculture, followed by wood

extraction for timber and woodfuel, and mining, mostly concentrated around urban centers and mining areas. Both industrial mining areas, such as the mining centers of Tshikapa, Mbuji-Mayi (Kasaï-Oriental) and Kolwezi (Lualaba), Lubumbashi (Haut-Katanga), and artisanal mining sites in Bas-Uele, Haut-Uele, Ituri, Tshopo (Former Province Orientale), the Kivus (North-Kivu, South-Kivu) and Maniema are associated with intensive forest loss (Potapov et al., 2012). The country's rich mineral resources include: cobalt, coltan, copper, diamonds, gold, niobium, tantalum, tin, tungsten and uranium (USGS, 2016), as well as oil and gas. Between 1990 and 2010, mining concessions and conflicts have been important factors in deforestation, with protected areas mitigating these impacts (Butsic et al., 2015). Since the decline of industrial mining in the 1990s, artisanal mining has boomed. This informal and poorly monitored sector has been associated with degradation of mining areas and has further fueled the conflict and insecurity in the east of the country. High mineral prices and DRC's investment friendly mining code from 2002 and *cadastre minier* (CAMI) have attracted foreign investors with an estimated 42% of the country's surface being allocated under mining titles. These mining permits often overlap with forest lands and designated or customary land uses (Mpoiyi et al., 2013). In the present uncertain political-economic climate, industrial mining activities are scaled-down, which is likely to quickly change when stability reemerges.

The DRC is one of the frontrunners in developing its REDD+ policies. The fact that extractives and related infrastructure development in the Congo Basin are expected to expand in the coming decades provides momentum to consider development pathways that are more sustainable. Reducing impacts of extractive industries on forests can contribute to national REDD+ objectives. While DRC's REDD+ plans provide some guidance for improved integration of extractive industries in REDD+ policies, they require more detail on how to achieve practical outcomes.

1.4. Objective and questions

The objective of the paper is to provide insights into existing options for involving the mining sector in achieving REDD+ objectives, by mitigating emissions related to deforestation and forest degradation and promoting development for populations in forest-rich developing countries. It details the case of developing REDD+ Standards for the extractive sector in the Democratic Republic of Congo (World Bank, 2016) and how, and under what conditions, these Standards benefit stakeholders.

The study was guided by the following questions:

1. What options exist for oil, gas and mineral development projects to achieve REDD+ objectives?
2. Why were REDD+ Standards for extractive industries proposed in DRC and how were these developed?
3. How can the REDD+ Standards for extractive industries benefit different stakeholders and what are the conditions for implementation and positive outcomes?

1.5. Methodology and approach

The methodology consisted of reviewing literature and policy documents and facilitating the process of development of REDD+ Standards for extractives industries in DRC. The review was based on a desk-based literature and document assessment of existing initiatives on oil, gas and mineral extraction, deforestation and REDD+. The literature search of available scientific and 'grey' literature was conducted in the databases of ISI Web of Sciences and Google Scholar. Keywords, based on the main research questions, guided the searches, followed by quick scan of the sources to confirm relevancy. As a result, it yielded over 100 unique relevant references that were stored in EndNote. The literature and policy documents were analyzed on content in relation to

the research themes. Relevance to REDD+ outcomes followed the notion of ‘Effectiveness, Efficiency and Equity (3Es)’.¹ Facilitation of the process to inform development of REDD+ Standards for extractive industries contributed to accessing relevant documentation and key informants. Materials from workshops, stakeholder meetings and field visits were assessed to identify challenges and conditions needed for future implementation of Standards.

2. Results

2.1. Options to achieve REDD+ objectives within the extractive industries

Based on review of earlier experiences of interactions between mining and forest sectors, this section focuses on options within the extractives sector for achieving REDD+ objectives. This means how well reduction of emissions from forest conversion could be achieved and whether this could be cost-efficient and with fair distribution of costs and benefits.

2.1.1. Experiences with integrating REDD+ objectives in the extractive industry sector

National REDD+ policies that are currently being developed often consider the mining sector as one of the main drivers of deforestation. The sector is regularly represented in national REDD+ platforms by mining ministries at the national and decentralized levels and to a lesser extent by the extractive industries in private sector platforms. Development of concrete activities to involve extractive industries in reducing emissions from deforestation and forest degradation was observed for less than half of the tropical forest countries developing REDD+ strategies: Cameroon, Colombia, Democratic Republic of Congo, Ghana, Guyana, Indonesia, Laos, Peru, Republic of Congo and Vietnam (World Bank, 2015). In general, a lack of inter-sectoral planning and the predominance of the extractive industry sector in driving economic growth, were identified as the main challenges to effective integration of the extractive industry sector in REDD+ policies. For the countries that did propose strategies in national REDD+ plans, examples of interventions on extractives are:

- Improving regulation and enforcement of social and environmental standards.
- Taking a landscape approach and establishing cross-sectoral working groups.
- Supporting alternative livelihood options for ASM.
- Improving technologies and standards for lower emission mining.
- Allocating mining-free zones.
- Reducing illegal mining.
- Supporting effective reclamation.²

Extractive industries mostly do not yet explicitly mention REDD+ in their sustainability reports or initiatives, but they often do have relevant environmental and social policies in place that offer practical linkage to REDD+ objectives. Companies’ management plans with regard to biodiversity, land management, rehabilitation and climate

¹ The ‘3E principle’, has been regularly applied in the context of REDD+ to assess proposed REDD+ interventions (Angelsen and Wertz-Kanounnikoff, 2008). The ‘3E Principle’, originally proposed by Stern, 2008 and further developed by Center for International Forestry Research (CIFOR), can be applied to assess proposed options and expected outcomes of an intervention and to evaluate actual outcomes. The questions linked to contributions to REDD+ within the extractive sector were: How well can interventions on extractive industries achieve reduction of GHG emissions (Effectiveness)? How cost efficient can these emission reductions be achieved (Efficiency)? How fairly are costs and benefits distributed (Equity)?

² Based on review of the subsequent REDD+ planning and policy documents: Ghana FIP, 2012; FCPF, 2014, Ghana ER-PIN; FCPF (2012), Guyana R-PP; Indonesian REDD+ Task Force (2013); Indonesia ER-PIN, 2014, Peru FIP, 2012; Peru ER-PIN, 2014; Republic of Congo R-PP, 2012, Republic of Congo National REDD+ Strategy, 2016.

change are of particular relevance. In terms of emission reduction targets, mining operations consider foremost their own energy use and emissions of the final energy footprint, which constitutes the largest share of company GHG emissions. In that sense, the benefits of wider land management and avoiding deforestation may seem less important from the company’s point of view, particularly as the indirect impacts of company operations are usually not considered to be part of their management responsibilities. However, for sustainable land management and REDD+ objectives, mitigation and compensation efforts from extractive industries, such as: land rehabilitation plans, strong environmental policies in place at concessions, as well as carbon offset schemes, do offer relevant contributions. The mining industry has started to engage on the issue of climate change and stressed its commitment to reduce emissions and support lower-carbon economies prior to the United Nations climate change conference in Paris in 2015 (COP21) (International Council on Mining and Metals, 2015). Avoiding deforestation and supporting REDD+ to minimize environmental impacts and GHGs are, for example, mentioned in BHP Billiton’s climate change portfolio analysis (BHP Billiton, 2015). At an international level, global standards for extractive industries cover areas relevant to achieving REDD+ benefits, such as: environmental impact, reclamation (of forest lands), ASM, land rights and reducing GHG emissions (World Bank, 2015).

2.1.2. Opportunities to achieve REDD+ objectives within the extractive industry sector

In considering how successful interventions targeting mining development could achieve actual emission reductions, there are three alternate options to consider: (1) avoiding operations, (2) mitigation of impacts and (3) compensation of impacts. Firstly, leaving oil and mineral resources underground is obviously the most effective way to avoid any GHG emissions from deforestation and degradation caused by operations. In some rare cases, this has indeed been suggested, such as for the Ecuadorian Yasuni initiative that proposed to leave almost a billion barrels of oil in the Yasuni national park un-extracted, in exchange for compensation of about half of the foregone revenues by international donors (Acción Ecológica, 2010).³ However, this plan was abandoned for economic reasons and renouncing extractive industries’ operations is broadly not considered a viable option because of the importance of immediate revenues to national economies in developing countries (Lowe, 2014; Stolle-McAllister, 2015). Secondly, mitigating impacts of extractive industries on forests, is considered a more viable option than targeting total avoidance and can be effective in reducing GHG emissions of deforestation and forest degradation. Mitigation measures entail, for example, improved mineral waste management, improved management of bush fires, improved siting of infrastructure to reduce the overall physical footprint, sensitizing workers, instituting company policies on reduced impact operations, involving local population and managing of logging and access to concessions. Guidelines on reducing impacts are embedded in several international standards and national legislations on Environmental and Social Impact Assessments. Long-term, post-mining impacts can be mitigated through well-planned (during the project development stage) continuous restoration and revegetation activities. Revegetating mining sites reinforces the carbon stocks sequestration potential of mined-out lands when it involves local communities and prioritizes forest-based land uses over other land uses (Hirons et al., 2013; Lowe, 2014). As a third option of interventions targeting extractives and REDD+, besides avoiding

³ Despite some pledges made to support the initiative, these plans have been abandoned by the government in mid 2013 after a commission concluded that it would not be economically viable (The Guardian, 2013). The announcement of Ecuadorian President Rafael Correa to start oil exploitation upon failure of the Yasuni IIT plan was met with loud protests from environmental and indigenous groups, showing an ecological struggle and polarized view between actors on development needs of the country (Stolle-McAllister, 2015).

impacts and mitigating impacts, mining operations can compensate residual impacts on forests. By voluntary means or legal obligations, companies contribute to REDD+ outcomes by offsetting their residual environmental impacts through initiatives to protect or restore forests (Virah-Sawmy et al., 2014).

Cost efficiency of options for extractive industries to contribute to REDD+ depends on implementation costs, costs of monitoring systems, compensation for lost income (opportunity costs), and rents (Angelsen and Wertz-Kanounnikoff, 2008). Assessing cost-efficiency of initiatives targeting extractive industries (and other high-profit sectors) is sometimes reduced to calculations of lost income due to avoidance of oil and mining activities in forest areas. These opportunity costs include direct economic losses due to un-extracted minerals and indirect costs due to loss of labor and suppliers from other sectors (Lowe, 2014). In this case, the opportunity costs are considered to be too high for these sectors to contribute efficiently to reduced deforestation or degradation (Karsenty and Ongolo, 2012; Purnomo et al., 2012). As a consequence, REDD+ as a market mechanism to offset the extractive activity is found to be 'untenable' considering the high value of the foregone extractive revenues (Fletcher et al., 2016). One key challenge here is that the 'real costs' of mining, which include the full life cycle of a mine including post-closure restoration, are often missing or highly underestimated. For DRC, the (much criticized) McKinsey report that applied a REDD+ cost curve (McKinsey and Company, 2009), specifically noted that mining should not be tackled as a priority due to high opportunity costs. In contrast, when discussing a broader set of options that does not target avoidance of mining activities altogether, but instead promotes mitigating or compensating impacts on forests, initiatives can become cost efficient. Regulation of environmental impacts and mitigation or compensation measures could reduce deforestation and degradation at a fraction of the opportunity costs (Dyer and Counsell, 2010). Companies can, for example, be obliged to open a bank guarantee that covers restoration costs in the event of premature closure or abandonment of the mine, which contributes to more realistic life cycle cost-benefit analysis. More attention drawn to supply chain responsibility within industries operations can gradually move mining sectors towards "a zero-net- deforestation business model" (Boucher, 2015). In addition, there are cost savings due to implementation of practical measures that simultaneously reduce costs and avoid deforestation. Examples include strategic reduction of the infrastructure footprint through closer placement of interacting infrastructures, choice of low impact technologies, smaller drill platforms or narrower roads and tracks, all of which save on transport costs and rehabilitation costs (e.g. CamIron Ltd, 2010). Carbon stocks sequestration of forest areas that compensates all emissions related to extractives' operations represents potential financial benefits that can again be used to support reforestation and community development initiatives (Hirons et al., 2013). Conversely, deforestation that is not accounted for by mining operations signifies a loss of potential REDD+ credits and revenues for developing countries.

REDD+ projects can actively contribute to better equity outcomes when including participation and diversity (of gender, ethnicity and assets such as land tenure) of various stakeholders (Angelsen and Wertz-Kanounnikoff, 2008). Successful implementation of the principle of communities' rights to Free, Prior and Informed Consent (FPIC) in REDD+ mechanisms benefit outcomes of social equity (Mahanty and McDermott, 2013). In Peru, REDD+ processes contributed to rights of indigenous people and participatory approaches embedded in recent FPIC and forest policy development (Dall'Orso, 2015). Revenue sharing mechanisms can be based on existing experiences that have already been gained in the mining sector. Over 30 countries in the world have specific mechanisms in place for distribution of revenues from non-renewable natural resources that help raise standards of living in specific regions, or instead, when badly executed, aggravate local inequalities and raise tensions (Bauer et al., 2016). Moreover, as part of sustainability strategies, the mining industry could establish a more direct link between mining activities and REDD+ outcomes by active

rehabilitation of mining sites and development of local communities. Community involvement in mining operations' efforts to avoid deforestation and to restore forests is likely to reinforce REDD+ outcomes by increased transparency, improved data collection and increased positive outcomes for equity and benefit sharing (Hirons et al., 2013). Initiatives of mining companies together with local communities can also target activities that reduce overexploitation of forest resources caused by communities, by offering alternatives, such as agro-forestry or more efficient use of woodfuel or alternative energy sources.

2.1.3. Risks to initiatives within the extractive industry sector for REDD+ objectives

Effectiveness and cost-efficiency of avoiding extractive operations in forest zones is low due to the location-bound activity of oil and mineral exploitation and high opportunity costs. Options regarding mitigation and compensation of impacts on forests do offer potential, but the following risks need to be considered:

REDD+ countries may lack clear land tenure provisions, which leads to overlapping and competing land allocations between sectors and administrative levels, which complicates integration of different sectors in national REDD+ policy (Brockhaus et al., 2012; Childress, 2010; Hirons, 2016). Mining related policies and other land uses tend to clash with REDD+ objectives, as has been reported for Peru, Indonesia, Cameroon and the Philippines and reforms may be obstructed by vested economic interests of existing bureaucratic structures (Di Gregorio et al., 2012; Lasco et al., 2013; Murdiyarto et al., 2012; Eilenberg, 2015). Lack of political will, contradicting interests or a lack of co-ordination between sector ministries in forest and mineral rich developing countries are a barrier to any real forest governance reforms as a result of REDD+ and other forest management initiatives (Ongolo and Karsenty, 2015). Indirect drivers of deforestation and forest degradation, such as the influx of migrants or cash flows in forest areas, are often not yet sufficiently documented and understood. Poor monitoring and enforcement of laws, and the informal character of artisanal and small-scale mining undermine effectiveness of proposed mitigation and reclamation measures (Hirons et al., 2013; Rendon Thompson et al., 2013). Industries' and governments' initiatives are often project based, while outcomes need to be achieved and assessed at landscape levels. Monitoring of interaction between forest carbon and extractives is complicated because most REDD+ countries lack information on the scale and impacts of oil and mining operations on forests and companies do not always report on carbon stocks in their sustainability reports (Hirons, 2013a). Offset schemes may experience difficulties due to disagreements on ecological and economic values of replaced forests and lack of applying scientifically based measures for calculations of offsets and assuring permanence (Virah-Sawmy et al., 2014). Direct or indirect leakage undermines effectiveness of initiatives in the extractives sector. Direct leakage occurs for example when a ban on mining in one forest region causes increased mining in another forest region. Indirect leakage takes place when reducing impacts in one sector increases those in another sector. One example of such indirect leakage is the Ghanaian chainsaw ban imposed in 1998 that drove rural populations from timber exploitation to artisanal mining (Hirons, 2013b). Failure to address equity issues could aggravate existing tensions and result in more forest loss. National and regional governments may claim community lands for REDD+ funding when local populations cannot exert rights over carbon stocks or when mining exploration and exploitation rights overlap with other designated land uses, threatening local livelihoods (Childress, 2010; Doherty and Schroeder, 2011). The position and contribution to poverty alleviation of ASM can be threatened when REDD+ policies exclude or marginalize these types of activities (Hirons, 2011). Offset schemes may exclude local land users from practicing their livelihood activities, lead to land evictions and provide insufficient compensation to pay for their lost income (Olsen et al., 2011; Pearce, 2010; Seagle, 2012).

In summary, effectiveness and cost-efficiency of avoiding extractive

Table 1
Potential of interventions, opportunities and risks, targeting the extractive industries for REDD+ objectives.

GHG of deforestation and forest degradation due to extractives	Opportunities	Risks
Avoidance of emissions	Limited, because operations are location bound and importance of extractives sector to economic development	<ul style="list-style-type: none"> ● Replacing of mining by other economic sectors that cause more impact and loss of income generating activities ● High opportunity costs
Mitigation of emissions	Good opportunities to limit impacts on forests and related emissions, while involving community participation	<ul style="list-style-type: none"> ● Poor monitoring and law enforcement at landscape level ● Uncertain land tenure ● Lack of baseline data ● Conflicting land allocations and sectoral interests ● Failure to address equity ● Informal mining activities ● Exclusion of ASM activities ● Displacement of deforestation activities ● Non-consideration of indirect drivers of deforestation
Compensation of emissions	Offsetting of impacts on deforestation can compensate emissions and increase forest cover	<ul style="list-style-type: none"> ● Failure to assure permanence ● Difficulty in calculating offsets ● Exclusion of local land users ● Insufficient compensation ● Diverting away from avoidance and mitigation responsibilities

operations in forest zones is low, due to the location-bound activity of mineral exploitation and high opportunity costs. Options regarding mitigation and compensation of impacts of mining on forests do offer potential, but the identified risks need to be considered and overcome. [Table 1](#) summarizes the potential opportunities and risks of initiatives within extractives for REDD+ outcomes.

2.2. Developing REDD+ Standards for the extractive industry sector, the case of DRC

DRC ranks among the first countries involved in the REDD+ process since its onset in 2005 under the United Nations Framework Convention on Climate Change (UNFCCC) and appears among the most advanced REDD+ participants.⁴ Mining and associated infrastructure have been identified among the drivers of deforestation and forest degradation in the country ([Butsic et al., 2015](#); [Popatov et al., 2012](#)). Developing approaches that balance the need for economic development, including the extraction of mineral and oil resources, and the conservation of natural forests and biodiversity, are an increasing priority given the prospects of a rapidly increasing mineral and oil sector in the DRC ([Hund and Megevand, 2013](#)). A 2014 assessment found that 590 companies, holding in total 6727 permits, are active in mining activities throughout the country ([World Bank, 2014](#)). The permits represent 39% of the total country, mainly in the form of research permits, with 2% of the country under a mining lease. Often the lands of the permits overlap with designated protected areas and 24% of the country's intact forest areas overlap with mining permits,⁵ which is a clear direct threat to forest conservation ([Figs. 1 and 2](#)). In addition, the rehabilitation of the country's road network, of which 4255 km pass through intact forest landscapes, and new construction of dams and electricity lines induce further deforestation ([World Bank, 2014](#)). So far, initiatives to improve the country's mining sector, such as the Extractive Industries Transparency Initiative (EITI), the Kimberley Process for diamonds and the various initiatives to certify other artisanally mined minerals as 'conflict free', have mainly focused on governance, human rights and transparency, and less on environmental outcomes.

Policy developments on REDD+ in DRC offered opportunities for

⁴ DRC has benefited from several initiatives aimed at supporting its REDD+ policy and investment process, including Forest Carbon Partnership Facility (FCPF), the United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (UN-REDD), Forest Investment Program (FIP) and Congo Basin Forest Fund (CBFF) funding. The REDD+ process in DRC is led by the Ministry of Environment, Nature Conservation and Tourism (MECNT).

⁵ Intact forest areas overlap constitutes 3% mining leases, 7% exploration licenses and 14% research licenses.

developing the country's extractive industries within the context of mitigating climate change and protecting forest resources. DRC's Readiness Preparation Program (RPP) of 2010 identified 'infrastructure extension for formal and informal mining' as one of the causes of deforestation.⁶ The RPP furthermore noted the relatively high opportunity costs (above 60 EURO/t CO₂) to reduce or replace extractive industries activities (note the earlier discussion on the relative importance of direct opportunity costs), but also listed several opportunities for reducing impacts on forests by the oil and mining sector:

- Select zones for future mineral development activities.
- Impose reforestation after extraction and limit eviction of local populations.
- Enforce benefit-sharing mechanism as required under the 2002 Forest and Mining codes.
- Clarify legal status of overlapping land rights and land uses ([MECNT, 2010](#)).

The country's national REDD+ Strategy Framework that was adopted in 2014, specifies measures to mitigate negative impacts and optimize benefits from private sector investments in general and the oil and mining sector in particular:

- The development and implementation of ambitious land governance to optimize land use and natural resources.
- The revision of the legal framework of the extractive sector.
- Strengthening law enforcement regarding social and environmental safeguards.
- Supporting research on the impact of extractives on the forest (both large scale and small scale) together with mitigation and compensation measures.
- Supporting mitigation and rehabilitation plans of sites, Environmental and Social Impact Assessments and Environmental Management Plans with participation of civil society and local communities to limit damages to forests ([MECNT, 2014](#)).

DRC's Intended Nationally Determined Contribution (INDC) to GHG reductions, which was submitted to UNFCCC in 2015 in preparation of the Paris COP 21 climate conference, includes a targeted reduction of 0.6 Mt CO₂e GHGs emissions through mine and oil sites rehabilitation.

⁶ The RPP proposal for developing a national REDD+ strategy and other aspects of basic capacities, was submitted to FCPF in July 2010 ([MECNT, 2010](#)) and the Forest Investment Program (FIP) subcommittee endorsed its investment plan for REDD+ interventions in June 2011 ([MECNT, 2011](#)).

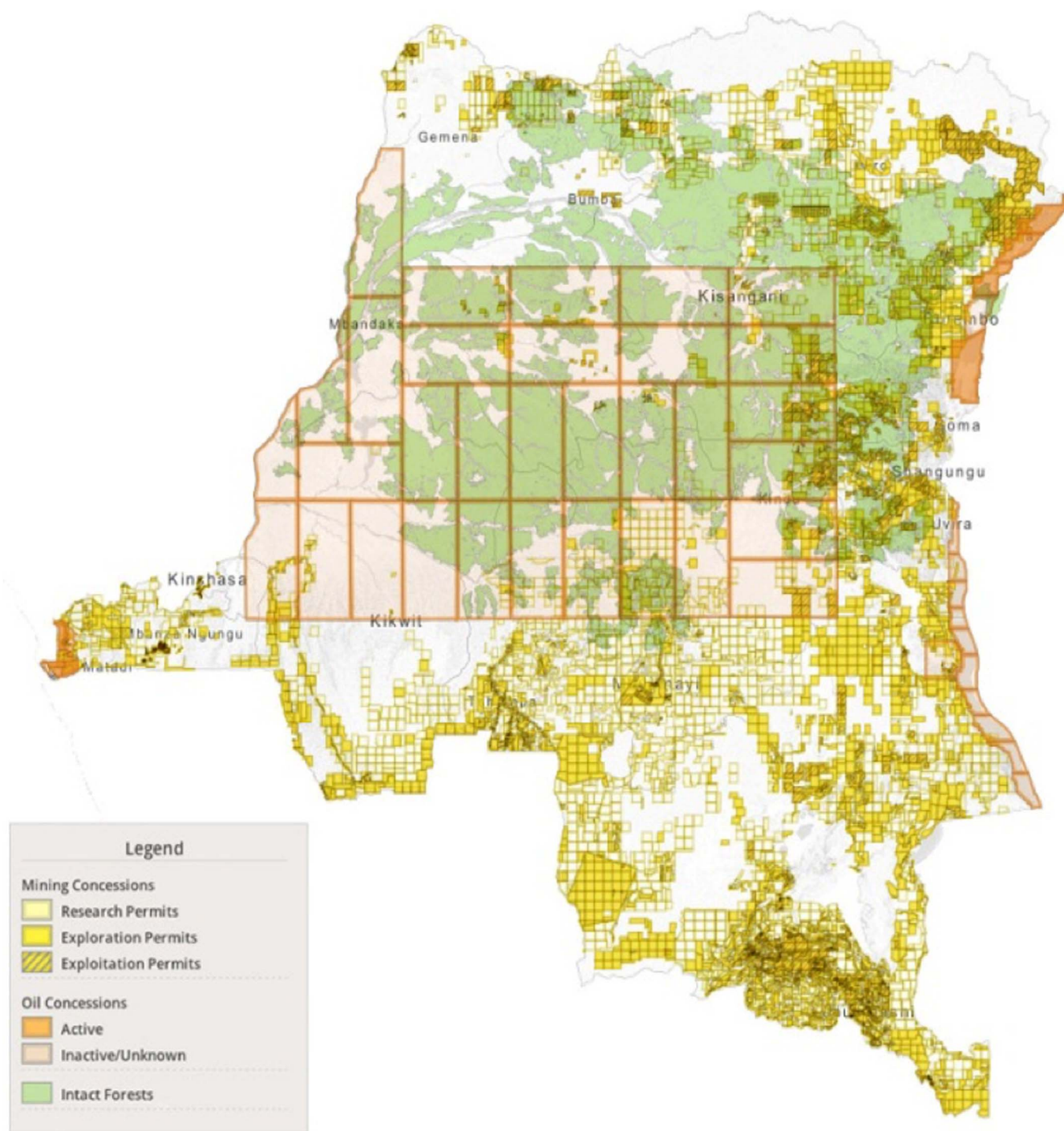


Fig. 1. Overlap extractives and intact forests in the DRC [NOTE to journal: In color]. Source: World Bank (2014).

This reduction is to be achieved through the establishment of a monitoring system and enforcement of environmental management plans (Government of DRC, 2015).

2.2.1. Developing REDD+ Standards for extractive industries

As part of wider governance reforms and recognition of the need to tackle direct and indirect causes of deforestation, in 2013 the DRC government adopted measure 13d of the national Economic Governance Matrix that calls for the “adoption of REDD+ standards for all mining and hydrocarbon investments conducted in forested areas” (CTR, 2015). The subsequent process to inform development of REDD+

Standards for the mining sector was part of an initiative facilitated by the World Bank with Norwegian funding to support these governance reforms by the DRC Government. The first phase in 2014 and first half of 2015 consisted of a review of international experiences, mapping of stakeholders and legal framework in DRC, and an analysis on potential impacts of the mining sector on REDD+ and forest conservation in DRC. The second phase that started mid-2015 was coordinated by the technical reforms monitoring committee (*Comité Technique de Suivi des Reformes: CTR*) and included field visits, training and consultation workshops and meetings held with private and public stakeholders. The field visits were conducted in the provinces of Sud-Kivu and Maniema

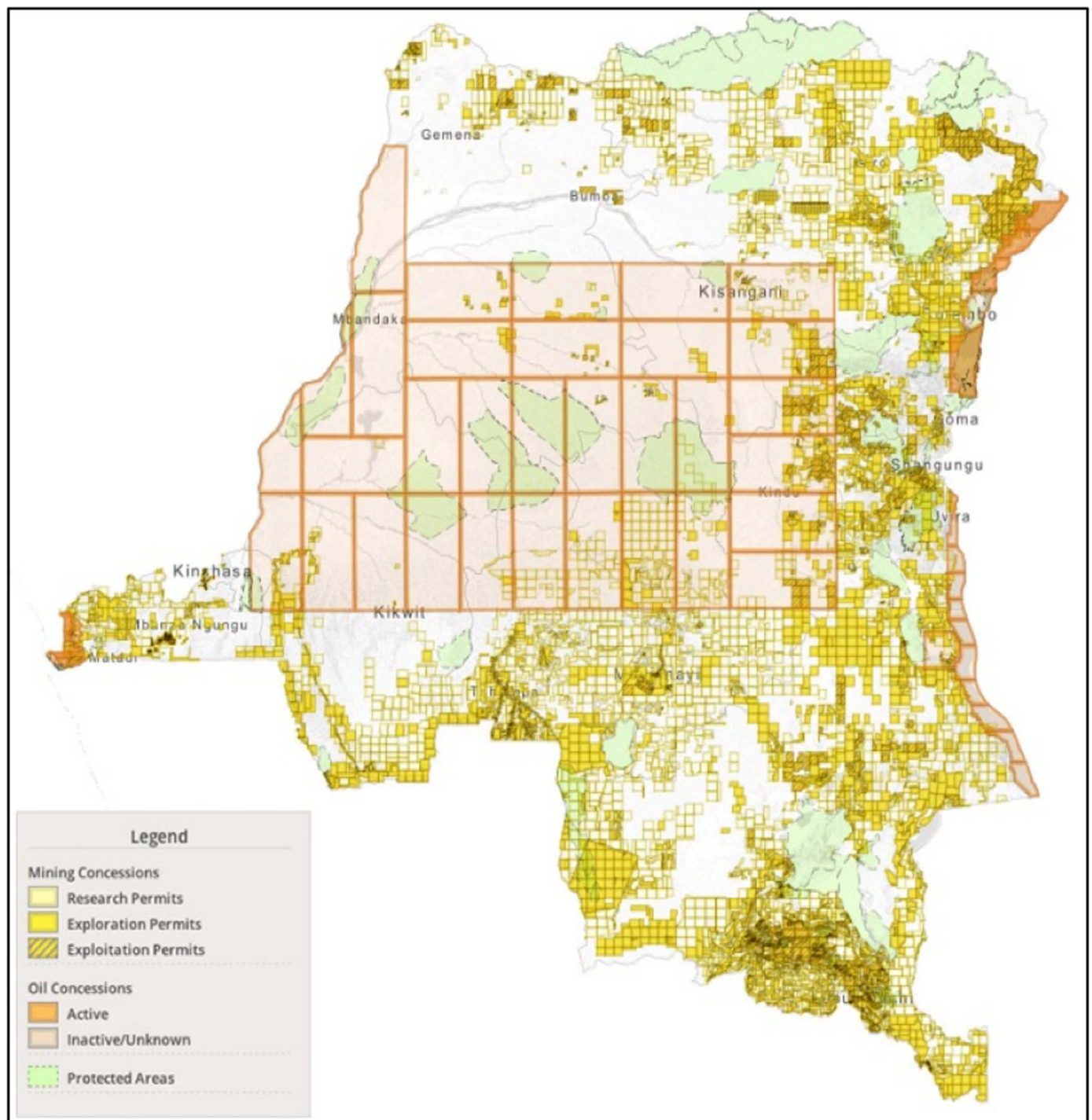


Fig. 2. Overlap extractives and Protected Areas in the DRC [NOTE to journal: In color]. Source: World Bank (2014)

on the sites of Banro Mining, in Katanga on the site of TF Mining and in Bas-Congo on the site of Perenco and the Integrated REDD+ pilot project around the Luki Biosphere, managed by WWF. Participants included REDD+ focal points of different relevant ministries (Environment, Mining, Petroleum, Land management, Land rights and Finance) together with experts of the World Bank and the NGO *Conseil pour la Défense Environnementale par la Légalité et la Traçabilité* (CODELT). Two further workshops were held in November 2015 and February 2016 to draw lessons from the field visits with the various participants and the National Committee on REDD+. Draft Standards were then developed based on the outcomes of this process involving government, civil

society and industry representatives.

The draft Standards aim to guide all extractive activities in forest zones with the purpose of avoiding, mitigating or compensating their impact on forest cover. The draft Standards state a clear goal of zero net-deforestation. They contain explicit requirements of incorporating direct and indirect deforestation and forest degradation within environmental management systems. The Standards are founded on basic principles of REDD+, including permanence of the achieved reductions, additionality of these reductions compared to reference expectations, safeguard measures regarding livelihood options for local populations and avoidance of any leakage effects from displacement of

activities to other forest areas. The Standards refer to other important national policies, such as the action plan on climate change and the legal framework on environment and extractives. The Standards are furthermore informed by international standards and best practices, such as the IFC Performance Standards, the guide on best practices on biodiversity in the mining sector (ICMM), Forest Stewardship Council standards and ISO standard 14001 on environmental management. The draft 'REDD + Standards for mining and oil investments in forest zones' (*Normes REDD + pour les investissements miniers et hydrocarbures dans les zones forestières*) consist of eight standards, followed by a short description with scope of application and a brief explanation (World Bank, 2016):

Standard 1.. Mining and oil companies commit to the principle of zero net-loss of forest cover

This standard is intended to ensure compliance with all commitments to forest protection and stabilization of forest cover during the life cycle of operations, including exploration, production and closure, with the ultimate objective of zero net-loss of forest cover. Zero net-loss implies both replacement of deforested areas as well as potential increases in forest cover to compensate for incomplete replacement. It would include a mandatory offset strategy as part of the environmental management plan. A point of contention remains the extent of responsibility of mining companies. From a practical viewpoint, it is argued that companies can only be responsible for the geographic span of their own concessions. The draft Standards on the other hand contend that indirect deforestation caused by in-migration of job seekers often has a larger footprint than direct mining impacts and thus needs to be taken into account. It is argued that the initial environmental and social impact assessments, when done in a participatory way, can identify the plausible zone of influence of mining operations and respond accordingly.

Standard 2.. Mining and oil companies strengthen national forest cover management plans

In planning mining activities, companies integrate spatial planning objectives of the State that serve to maintain or increase national forest cover. While the first Standard defines the overall objective of zero net loss of forest cover, the second Standard emphasizes the need for synergies with government policies and plans. As policy evolves, industry practice can adapt accordingly through its continued consultative process and continued monitoring. Principles of connectivity and integrity of ecosystems are implied here. Extraction of minerals follows a mining company's long-term extraction plan that maximizes profit. This often means extracting the purest and most accessible ore first. Integrating national forest cover management plans (this includes government authorized plans by third parties such as logging companies, plantations, or REDD+ programs) as a decision-making parameter, can lead to mining companies deciding to forego or postpone extraction of certain mineral rich sites in favor of, for example, maintaining a biodiversity corridor.

Standard 3.. Mining and oil companies adopt a forest protection plan

In line with the national forest cover management plans, economic operators shall develop a plan containing a strategy against deforestation and forest degradation, to avoid, limit, repair and offset the direct impacts generated by operations. This integrated life of mine planning strategy should include extensive controls on clearing and progressive revegetation. The plan also takes into consideration all indirect impacts reasonably attributable to the area of influence of the company. These include impacts on the forest as well as the socio-economic impacts of deforestation and forest degradation on affected communities.

The forest protection plan emanates from the environmental and social impact assessment that is generally required by law to be conducted. In most countries, the requirement is understood to be a biodiversity action plan. This generally does not include any form of forest

tree inventory, although often commercial tree species are inventoried on an ad-hoc basis once areas are designated for clearing as these trees are taxable by forest authorities. For the areas within the mining concessions, it is recommended to conduct full scale inventories similar to those conducted by logging companies as a base-line inventory. For areas outside the concession but within a predefined zone of influence it is more realistic to accept default values agreed upon with government authorities or other secondary data, such as from national REDD+ or carbon inventories. The forest protection plan can be part of the wider biodiversity plan that takes into account critical habitat criteria, but needs to be auditable according to REDD+ criteria and thus also include monitoring of degradation (for example monitoring exploitation of specific tree species for charcoal production).

In the case of artisanal or small-scale mining it is recommended that the forest protection plan is established by or with the competent authorities for the entire area covered by small scale mining, considering there is not one single commercial entity responsible for all the activities. The plan needs to include quantified rehabilitation solutions, such as natural regeneration of forests, assisted natural regeneration, agroforestry, plantations for local use including for energy purposes, dissemination of fuel efficient stoves and allocation of buffer zones.

Standard 4.. Mining and oil companies integrate management of deforestation and forest degradation in their environmental and social performance management system

The company integrates a risk management strategy covering deforestation and forest degradation into its overall environmental and social management system. The strategy is based on the principle of continual improvement of environmental and social performance in the area of influence of the company, and is aimed at reducing greenhouse gas emissions, increasing the welfare of local populations and securing the economic viability of operations in the long-term.

This standard must consider a life-cycle approach of the company's entire operating cycle and aim for continual improvement of performance. Inspired by the IFC Performance Standard on management systems as well as ISO 14001, there are typical REDD+ considerations to take into account. This includes identifying the drivers of deforestation and degradation of forests, proposing risk reduction interventions that can render plausible the "permanence" of solutions (under REDD+ this implies a minimum of 20 years) and ensuring avoidance or minimisation of displacement of activities causing deforestation or degradation.

Standard 5.. Mining and oil companies adopt the principle of consultation and informed participation

Formal and structural stakeholder engagement, in particular of affected communities, is crucial every step of the way. The principle of consultation and informed participation is adopted to guide decision making on options for respective operations as well as their possible consequences on the forest. Joint decision-making and planning aimed at a win-win solution is sought in terms of maintaining and restoring forest cover, limiting greenhouse gas emissions, protecting sites and species with cultural significance and guaranteeing the associated benefits for forest-dependent populations. The point is to jointly discuss alternative interventions and jointly agree upon those that best reduce risks for the respective land users and most effectively reduce deforestation and degradation of forests.

Standard 6.. Mining and oil companies integrate a financial security mechanism to guarantee management of direct and indirect deforestation and forest degradation in their area of influence.

Financial security mechanisms can take many forms. In general, national legislations cover financial guarantees for rehabilitation or closure. In these cases, it suffices to include explicit reference to guaranteeing the REDD+ obligations under the Standards. While these responsibilities can be budgeted under different budgets it is

recommended to maintain planning and control duties under the department responsible for environmental aspects of the company, while the budget for rehabilitation activities be managed under the department responsible for operations.

During exploration and until the company makes a profit, it is recommended to maintain a minimum budget to enable the company to meet its obligations under the REDD+ Standards. This implies an annual amount for continued monitoring of deforestation and degradation, rehabilitation and co-benefit efforts, reporting and at least an audit once every five years. For the commercial stages of the project, international best practice recommends that a percentage of revenues after tax benefits, calculated over the expected returns over the life cycle of the project, be allocated to forest stewardship.

Standard 7.. Mining and oil companies integrate the price of forest carbon in their internal accounting system.

Companies commit to including the value of forest carbon as an accountable asset in the exploration, exploitation and closure of mining operations by defining an internal carbon price. Clearing the forest for an access track and a drill platform reduces the forest carbon assets, while replanting the areas or allowing them to regenerate increases the stock.

Worldwide there is a growing trend of corporations that report on use of internal carbon pricing to offset the costs and risks of greenhouse gas production, and to finance the transition to secure sources of low-carbon energy (CDP, 2015). In the spirit of these developments and of the global initiative “Put a Price on Carbon Statement” to which the DRC became a signatory in September 2014, these Standards recommend the inclusion of forest carbon stocks in the internal accounting of companies. By way of example, with a recommended price of 30 USD/ton of CO₂, clearing one hectare of tropical forest sequestering 250 metric tons of carbon would cost $30 \times 250 \times 44/12$ (conversion factor of carbon to carbon dioxide) = USD 27,500.

Standard 8.. Mining and oil companies engage to establish a system to measure, report and verify the actions taken against direct and indirect deforestation and forest degradation.

Stakeholders commit to establishing a system for measuring, reporting and verifying actions against direct and indirect forest deforestation and degradation. The level of detail of the system must be adapted to the intensity of the impacts on the forest. A clear link with Standard 6; the financial security mechanism, needs to be established in order to make sure that strong financial incentives for good performance are in place. The precautionary principle requires a higher level of detail under conditions of uncertainty, such as estimates/verification of indirect deforestation caused by third parties located within the sphere of influence of the economic operator after operations began.

International best practice recommends adherence to the Global Reporting Initiative (GRI) Standards (GRI, n.d.). It is intended that reports from all companies adhering to the REDD+ Standards be consolidated at national level in order to present an overall REDD+ picture of the extractive sector. This is to be included in the national communications to the UNFCCC in the context of the reporting obligations under the DRC Nationally Determined Contribution following the Paris Climate Accord (COP 21).

2.2.2. Potential benefits of REDD+ Standards and conditions for implementation

The inclusion of development of Standards on REDD+ for the extractive industry sector in the Governance Matrix of the DRC was a response to gaps in national legislation and governance regarding impacts of extractive industries on forests and new national targets regarding REDD+. The process for developing the draft Standards benefited from a cross-sectoral approach and work in an inter-ministerial group to find common interests and grounds for collaboration. The facilitation of exchanges between mining, forestry and conservation

sectors contributed to capacity enhancement on cross-sectoral issues of key stakeholders. Private sector actors took a leading role, acknowledging that integrating REDD+ Standards offer a risk management tool for dealing with outcomes of mining activities in forest landscapes as well as clear guidelines in the absence of an overall legal framework. In addition, the Standards offer a compass to other stakeholders and land users to better plan and manage risks in their respective operations. By means of its opportunity for consultation, planning and possibly co-management, they can influence choices of where to situate or schedule operations and negotiate co-management of forest protection activities.

The draft REDD+ Standards offer a coherent approach to all stakeholders and guide the mining sector towards green economy and lower-carbon objectives. A deliberate choice was made to promote an industry approach rather than a top-down prescriptive approach from government, given the early phase of policy development on REDD+ and extractives and overall weak governance capacity to enforce regulation. A clear target of zero net deforestation has been set. Mining companies can benefit from a standardized national approach and integrate commitments to REDD+ within their management systems. Existing tools, such as environmental management systems and action planning following environmental impact studies are adapted to explicitly incorporate issues of deforestation and degradation of forests. The industry Standards must complement the government's regulatory framework of land use plans, environmental and climate targets. A holistic vision on the impact on forest cover is given, including both direct and indirect deforestation. This expanded the scope of companies' responsibility, which reflects recent trends in the sector. For example, since 2004, Rio Tinto considers impacts on biodiversity beyond the confines of its concession and distinguishes planned deforestation “behind the gate” (the concession) and three levels of deforestation beyond the gate (Rio Tinto, 2004, 2008). Since 2015, BHP Billiton is seeking alignment with ICMM reporting guidelines on biodiversity impacts beyond the confines of the mining concessions (BHP, Billiton, 2015). Options for consultation and collaboration facilitate joint decision-making that targets reduced common impact on forest cover. An example is the agreement between Geovic Mining SA and the logging company Pallisco-CIFM, in Cameroon. The agreement includes joint management of buffer zones, joint control of access roads and bush meat trafficking as well as an agreed upon schedule for strip mining and rehabilitation that respected the logging schedule of Pallisco (Van der Goes, 2013). Reporting requirements of extractive operators will permit establishment of the status quo and changes in deforestation and rehabilitation and related emissions at a national level.

Viability of implementing REDD+ Standards for the extractives sector in DRC depends among others, on continuing the holding of multi-stakeholder platform discussions and ensuring sufficient financing thereof. Furthermore, there is need for piloting of the Standards on representative sites to improve operational matters. Monitoring and reporting of efforts on REDD+ Standards would benefit from coherence with the national Monitoring, Reporting and Verification (MRV) system. Adopting Standards starts as a voluntary process, involving ASM and communities. As use of Standards further evolves and monitoring mechanisms are in place (possibly as part of REDD+ MRV system), Standards for extractives could eventually become formally integrated within the country's legal framework. Ultimately, formalization of REDD+ Standards can improve governance of extractives in forest landscapes through more transparency and creating a level playing field for competing extractive industry operators. Specific conditions for well-embedded REDD+ Standards and long-term positive outcomes, as identified for DRC, also offer relevant guidance to other forest and mineral-rich developing countries that are currently developing initiatives to address the extractive sector in their climate change mitigation efforts. These conditions are:

- Putting in place a permanent consultation platform.
- Formalizing the REDD+ Standards to improve governance by

transparency and creating a level playing field between investors.

- Integrating the REDD+ Standards in environmental and social management systems for large-scale mining.
- Integrating the REDD+ Standards in a code of conduct or plan for artisanal mining zones.
- Testing of the REDD+ Standards at pilot sites (industrial and artisanal sites).
- Integrating an MRV system into existing management systems of companies and establishing a reporting line of data from the mining company or artisanal mining zone to the national government. Ideally, the MRV system of the mining companies needs to be integrated into the MRV system developed for REDD+ at national level.
- Strengthening capacities of professionals and institutions involved.
- Establishing inventories of forest stocks within mining concessions and monitoring direct and indirect deforestation.
- Strengthening collaboration between respective land users to harmonize interventions.

3. Discussion and conclusion

In considering how well interventions targeting oil and mining development achieve actual REDD+ outcomes, several options have been identified. Strategies to avoid impacts of extractives on deforestation and forest degradation altogether are limited due to the weight of the sector in determining economic development and the fact that the activities are bound to the locations with mineral deposits. Clearing restrictions and phased clearing schedules can often be negotiated for land with high conservation or alternate land-use value, but they are difficult to enforce. Mitigating impacts from extractive operations can offer effective and efficient strategies to reduce GHG emissions of deforestation and forest degradation during exploration, production and rehabilitation activities. Mitigation measures entail for example: improved mineral waste management, integrated watershed management, better planning of infrastructure building, sensitizing workers, involving local populations, adoption of reduced impact logging practices, controlling access to concessions and continuous reclamation of mining sites. An integrated land/spatial plan for mining operations, together with related sectors (notably agriculture and forestry) and infrastructure building, could assist to limit indirect impacts of the sum of mining operations on wider forest zones. Compensation measures can contribute to increasing forest cover when companies offset the carbon emissions caused by their wider operations. REDD+ can actively contribute to improving social equity outcomes when including participation of local people and experiences from the mining sector with community involvement and revenue sharing systems may actually offer some good practices to build upon. Involving communities in monitoring forests in remote areas as well as in rehabilitation of mined-out lands can assist in reinforcing REDD+ outcomes.

Successful REDD+ interventions for the extractive sector need to overcome a number of prevailing risks, such as:

- Uncertain land tenure provisions and competing land allocations between sectors.
- Poor monitoring and enforcement of laws, complicated by informal mining activities and lack of national baseline data and company reporting on carbon stocks.
- Direct or indirect leakage of initiatives targeting extractives, to other sectors or to other forest regions.
- Exclusion or marginalization of legitimate ASM activities.
- Offset schemes that exclude local land users with insufficient compensation.

Although extractive industries are generally subject to national laws that require environmental impact assessments, broader and more holistic assessments that include the total sum of extractive operations

and related infrastructure development, as well as the direct and indirect impacts on forests, is often lacking. This means that there is no overview of the extent of (expected) impacts of the sector on deforestation and forest degradation, which complicates sectoral planning on how to best mitigate impacts. Policies of REDD+ countries that have been referred to in this paper could contribute to overcoming this governance void and achieve effective, efficient and equitable REDD+ outcomes. Prominent challenges to successful execution of these interventions are the limitations and difficulties with inter-sectoral planning and the vested interests in oil and mineral exploitation. Therefore, knowing and acknowledging the needs and priorities of governments of REDD+ countries, such as food security and economic development, must be the basis of any policy reforms that address conversion of forestlands (Ongolo and Karsenty, 2015). Integrating REDD+ objectives in extractive industries' sustainability policies can assist in filling the gap between industries' present GHG reduction targets related to energy and its policies on land rehabilitation and biodiversity plans that hitherto concentrate mostly on high value forests.

Developing draft REDD+ Standards for the extractives industry in DRC as part of wider governance reforms assisted in filling a governance void and guiding stakeholders regarding extractives in forest landscapes. The Draft REDD+ Standards for extractives industries are a first example of how developing REDD+ policy can influence the extractives sector. It broadens the perspective on how the extractives sector can contribute to achieving REDD+ objectives, redirecting corporate policies, from a narrow perspective on forest carbon markets to a broader take on how to achieve supply chain responsibility to avoid deforestation and source from Zero Deforestation Zones⁷ (Boucher, 2015; Meyer and Miller, 2015). The government can use the Standards as a coherent system to guide the extractive sector within green economy and low-carbon development pathways. The Standards are part of wider governance reforms and do not replace the importance of a landscape approach and land use planning, or other important options to have the extractive industry sector contribute to REDD+ outcomes, such as issuance of exploration licenses and infrastructure planning based on information and modeling of potential impacts on forests. Developing of REDD+ standards concurs with the emerging perspective that extractive industries have an extended responsibility to contribute to reducing their impact on degradation and deforestation. The experience of developing REDD+ Standards for the extractive sector in DRC in a multi-stakeholder process, and identification of conditions for implementation, can serve other mineral and forest rich countries that are presently developing their REDD+ strategies and nationally determined contributions (NDCs) to GHGs reductions.

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⁷ The notion of "Zero Deforestation Zones (ZDZs) is a solution to implement private sector deforestation-free supply chain commitments by leveraging synergies between Jurisdictional REDD+, private sector initiatives, and governmental laws and regulations. Companies would source commodities that meet their deforestation commitments from jurisdictions implementing REDD+ programs, government monitoring systems, and functioning private sector initiatives" (Meyer and Miller, 2015).

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