african centre for biodiversity

MULTIPLE SHOCKS AND THE EBOLA AND COVID PANDEMICS IN WEST AND CENTRAL AFRICA:

EXTRACTION, PROFITEERING AND SHATTERED FOOD SYSTEMS AND LIVELIHOODS

DISCUSSION PAPER

DECEMBER 2020

Multiple Shocks in Africa Series

The research for the discussion papers of this series was conducted under challenging conditions created by the COVID-19 pandemic and the consequent lockdowns and travel restrictions. As such, ACB researchers were not able to travel to the case study countries for on-the-ground research. We are therefore deeply grateful to our local partners who provided the necessary support in the focus countries (but who were also limited by lockdowns and other restrictions in their own countries) and to other key informants who provided invaluable information. The discussion papers are therefore aimed at providing a broad scoping of the shocks being experienced by the people of the focus countries and an initial dive into the interconnections between the processes driving these shocks. The ACB has a long track record of producing high quality and reliable research, but any potential errors or blind spots in this research series are those of the ACB. We welcome further input as we advance our collective knowledge and change project.

The African Centre for Biodiversity (ACB) is a research and advocacy organisation working towards food sovereignty and agroecology in Africa, with a focus on biosafety, seed systems and agricultural biodiversity. The organisation is committed to dismantling inequalities and resisting corporate industrial expansion in Africa's food and agriculture systems.

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Table of contents

Acronyms and abbreviations

ACB	African Centre for Biodiversity
BNI	Bernhard-Nocht Institute
DRC	Democratic Republic of Congo
DSI	Digital Sequence Information
EVD	Ebola virus disease
IMF	International Monetary Fund
NGO	Non-governmental organisation
PEF	Pandemic Emergency Financing Facility
REDD+	Reducing Emissions from Deforestation and Forest Degradation
WHO	World Health Organization
WRM	World Rainforest Movement

Glossary

Endemic	Restricted or peculiar to a locality or region. Endemic infection refers to a sustained, relatively stable pattern of infection in a specified population.
Epidemic	A large disease outbreak.
Host	Person or other living animal that affords subsistence or lodgement to an infectious agent under natural conditions.
Hotspot	Region where factor(s) are most densely aggregated, most highly prevalent, and where risk of a (disease) event is most intense.
'One Health'	The collaborative efforts of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals, and our environment.
Pandemic	A global disease outbreak.
Pathogen	Biological agent capable of causing disease.
Reservoir	For an infectious agent, an animal, person, plant, soil or other substance in which the agent normally abides.
Response	Interventions that involve practitioners using disease surveillance information to plan and execute activities that prevent infectious diseases from affecting human and animal populations, protect such populations against exposure to pathogenic microbes that evade prevention measures, and control morbidity and mortality among populations infected by pathogenic agents. In the DRC context, the term used in French was "Riposte".
Vector	An organism, such as an insect, that transmits a pathogen from one host to another.
Zoonose	Any infection or infectious disease transmissible under natural conditions from animals to humans or those shared between humans and animals. Zoonoses may be bacterial, viral, or parasitic, or may involve unconventional agents.

About this paper

This paper situates the Ebola outbreaks in West and Central Africa within a context of compounding shocks related to natural resource extractivism, industrial agriculture, deforestation and biodiversity loss, the undermining of rural livelihoods, and weak public health systems.

It explores the linkages between ecological disturbance/destruction, deforestation, zoonotic spill-over and disease resurgence through the lens of Ebola in parts of West and Central Africa (Sierra Leone, Liberia, Guinea) and Central Africa (DRC). We discuss the Ebola virus disease (EVD) and the series of outbreaks the region has experienced in recent years, and specifically focus on the case of the DRC, which experienced several outbreaks that were quickly contained, but also the second biggest Ebola outbreak in the world, which ended only in June 2020.

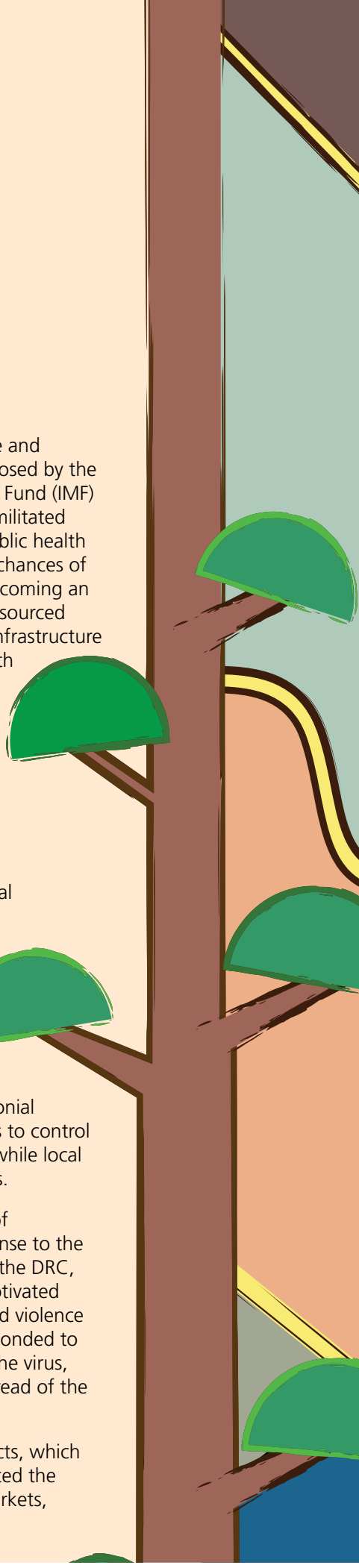
The research further investigates the impact that Ebola, compounded by the COVID-19 pandemic, had on rural peoples' livelihoods, and local food and security systems. It also looks at the nature of response measures, including in relation to public health in the context of armed conflict in the region.

The research expands on the multiple and compounding shocks that populations in the DRC have been confronted with over the past two years, each one further undermining the resilience of local farming systems, which form the backbone of many people's livelihoods.

The research was based on an extensive literature review and interviews with key informants. Because of the still volatile situation in the North Kivu Province, and the COVID-19 pandemic, many interviews were conducted telephonically. However, our DRC partners from the Common Front for the Protection of the Environment and Protected Spaces (FCPEEP) managed to meet directly with many people who were involved in the Ebola response. They also interacted with smallholder farmers from the impacted areas, which brought invaluable depth and nuance to the research, for which we are very grateful.

Key findings

- The COVID-19 pandemic has starkly exposed how vital a role biodiversity plays in ensuring human health, while our distorted global food systems actively destroy this biodiversity. Like other zoonotic viruses that have not reached similar global proportions – such as Ebola, Zika, Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) – COVID-19 epitomises the complex interactions between ecological disturbance, reduced biological diversity, and the emergence of new diseases. Ecological degradation is principally driven by multinational corporations, which behave like predators, vis-à-vis Africa's natural and human resources.
- Ecosystem collapse induced from extractive practices is linked to the emergence of the Ebola virus disease (EVD) in West and Central Africa over the past number of years, and possibly many other emerging infectious diseases. In the Democratic Republic of Congo (DRC), Ebola compounded pre-existing shocks stemming from the interconnection between biodiversity loss, economic subordination, armed conflict, fragile farming systems and depleted public health systems.
- Compartmentalised false solutions proffered to curb deforestation, in the form of continued and revived financialisation of nature, and promotion of "fortress conservation" in the context of the nebulous concept of "nature-based solutions", has become a veil behind which ecological destruction continues and will continue, unabated, unless halted. This is particularly disconcerting in light of the fact that Ebola is now regarded as being endemic to the DRC. This means that continued deforestation and biodiversity destruction will result together with outbreaks of further zoonotic viruses.
- The extreme pressures on livelihoods as a result of armed conflict, the extractives sector, and the absence of support for small-scale farmers is forcing more and more people into artisanal mining and charcoal harvesting. Due to no fault of their own, this is further breaching forest boundaries, making spill-overs of zoonotic diseases more likely.
- Decades of state failure and austerity measures imposed by the International Monetary Fund (IMF) and World Bank have militated against a functional public health system, increasing the chances of a zoonotic spill-over becoming an epidemic. The under-resourced state of public health infrastructure has been correlated with the fast-paced spilling over of the EVD from 2013 to 2016.
- Containing the Ebola epidemic was largely coordinated from 'outside,' by the World Health Organization (WHO) and international non-governmental organisations (NGOs). This led to mistrust and non-cooperation from affected populations due to well-founded perceptions of neo-colonial intentions and agendas to control or eliminate the poor, while local elites enrich themselves.
- Unprecedented levels of corruption in the response to the tenth EVD outbreak in the DRC, alongside politically motivated misinformation, sparked violence against those who responded to contain the spread of the virus, further accelerating spread of the virus.
- Repeated armed conflicts, which have historically disrupted the functioning of local markets,



combined with the rise of diseases affecting staple crops and animals over the past few years, as well as recent flooding, have deeply disrupted the agricultural sector. These cumulative shocks have been compounded by the Ebola and COVID-19 epidemics, which played a big part in precipitating chronic inflation of food prices and increasing the dependence of the eastern provinces of the DRC on food imports. These multiple shocks on the country have weakened the social reproduction capacities of rural communities and deepened their food insecurity.

- As the world's first Ebola vaccine gets licenced in Europe, the USA and the DRC (alongside other African countries) and novel anti-Ebola drugs are developed through the use of Digital Sequence Information (DSI) with no shared benefits accruing to the country and peoples from which it originated, we are left wondering about how international corporations are set to profit from this crisis. Another means through which private companies have profited from the outbreak is the Pandemic Emergency Financing Facility (PEF) set up by the World Bank in 2017, which promotes the issuing of "pandemic bonds". The PEF failed to materialise any form of financial support to the DRC, while investors were cashing in on coupons. This instrument has since been quietly terminated by the World Bank as pay-outs to developing countries during the Covid-19 pandemic were delayed and investors bailied out. It represents the warped logic, however, of subjecting human life, and death, to the logic of financialisation.

- These shocks urgently call for a rethinking of the extractivist development model that is locked in by finance, debt relations and powerful economic interests. Attention should instead be given to support people- and ecology-centred economies, such as strengthening village level food systems, starting with supporting rural livelihoods to build and ensure resiliency as an alternative to the influx of foreign capital that is so disruptive to local rural dynamics.

- The dual challenge of two global epidemics plaguing the country in a synchronous manner has overshadowed another outbreak that has caused a much higher death toll: measles. The current outbreak is the country's deadliest measles epidemic recorded to date (over 6 700 people had died at the time of writing) and the largest in the world today. The WHO also indicates that the continent is set to lose significant ground in efforts to control malaria as attention and resources get diverted to fighting epidemics.

- The large number of ecological studies investigating the origins of zoonotic diseases tend to be apolitical and decoupled from an analysis of deeper systemic issues, including capital investments underpinning the financialisation of agriculture, international trade, and socioeconomic crises. We are particularly concerned about ecological perspectives that promote "fortress conservation" solutions. These are typically devoid of human presence, and can be veils behind which ecological destruction continues, while further disenfranchising communities that depend on the forest for their survival.

- It also strongly signals the need to overhaul the "conservation without people" agenda and to protect the land and political and human rights of communities who depend on forests, who have been proven to be their best custodians, while improving awareness about potential reservoirs of emerging infectious diseases and bolstering capacity to track virus emergence, as well as the capacity of the public health sector.

- Furthermore, what has happened to the DRC's and many West African countries' health systems, and the link to the Ebola outbreaks, shows starkly the need for the South to find alternatives to the World Bank and IMF, who no matter their amount of public relations efforts, have not moved beyond the neoliberal playbook. This then also requires governments to reject austerity and make the investments necessary to confront ecological and social crisis, including in public health systems. Divestment in public health therefore needs to be reversed, and support given to making the investments required to build functioning public health systems: financial, human capacity, and institution-building. As the case of Ebola and its spread shows, public health systems are a crucial part of the ecological question. They cannot be left in the hands of aid organisations, the private sector, or global financial markets. Public health is a public good.

The linkages between **extractive practices** and **emergence** of disease

The link between ecological disturbance, deforestation, zoonotic spill-over and disease resurgence has received overdue and much warranted attention since the outbreak of the COVID-19 pandemic (UNEP and ILRI, 2020).

The emergence of zoonoses attributable to anthropogenic activities that create new niches for pathogens include "changes in land use, extraction of natural resources, animal production systems, modern transportation, antimicrobial drug use, and global trade" (Karesh et al., 2012: 1937). The link between deforestation and human health is recognised even by those at the top of the world's economic order. According to the World Economic Forum's ***Global Risks*** report (WEF, 2020), the steady rise of deforestation over the past two decades can be linked to 31% of outbreaks such as Ebola, Zika and Nipah virus. Populations living within or near fragmented forests are at much higher risk of infection due to increased contact with vectors at forest edges and the reduced biodiversity of the area.

This speaks to the critical importance of species diversity and the protective lining provided by forests against pathogens. This 'dilution effect', coined by Schmidt and Ostfeld (2001), self-perpetuates in biodiversity-rich natural systems; meaning that a region rich in diversity of species of vertebrates has protective effects against vulnerability of infectious diseases, especially vector-borne zoonotic diseases. Biodiversity thus acts as a buffer to infectious diseases. When this biodiversity is destroyed, and as the edges of forests become more barren, the risk of pathogens spilling over increases. It is thus both the destruction of forests as well as the concomitant encroachment at forest edges that increase the likelihood of zoonotic transmission.

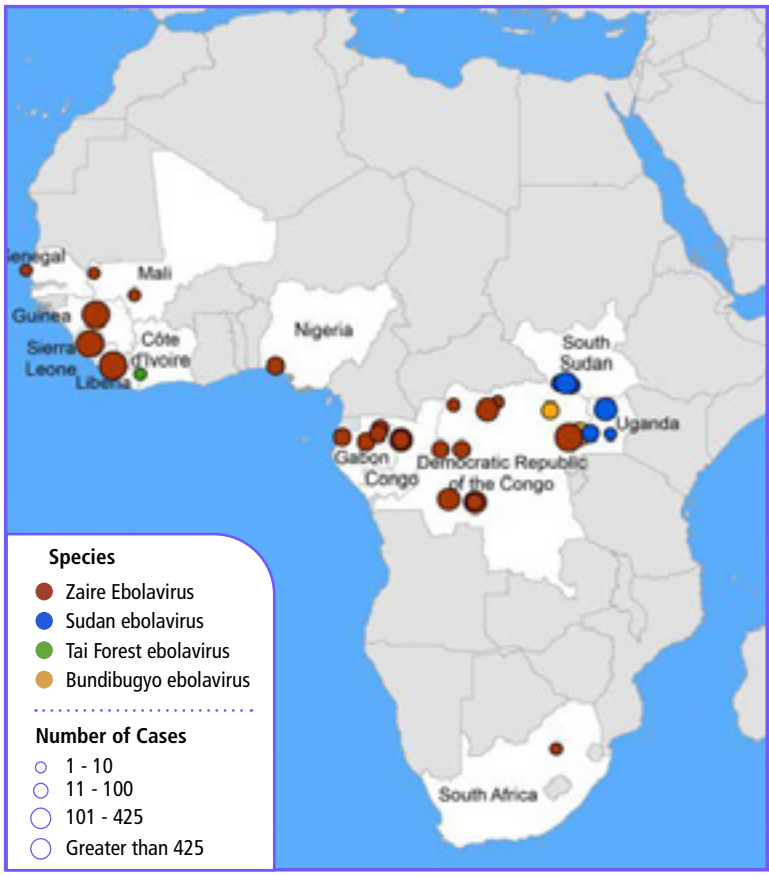
Depending on the context, the nature of the disturbance, the habitat loss and the reservoirs of infectious diseases, many kinds of spill-over dynamics exist (Karesh et al, 2012).

Many of the regions where intensive extraction is happening are "emerging disease hotspots" because they are rich in wildlife biodiversity (as in the DRC). This rich biodiversity is also true at the microbial level. With the increasing deep cutting into forests, the chances increase that species with which humans have not come into contact before will appear in the exposed edges. In essence, the land use change resulting from increased cutting into and extraction from tropical forests changes the composition of habitat and vector communities, modifying the distribution of wildlife populations and domestic animals, and therefore increasing exposure to pathogens. This makes spill-overs and outbreaks of diseases like Ebola more likely. However, this does not happen in a linear manner or neutral context. Hence, this paper situates the Ebola outbreak in a context of compounding shocks related to extractivism, industrial agriculture, deforestation and biodiversity loss, the undermining of rural livelihoods, and weak public health systems.

Understanding the Ebola virus disease (EVD)

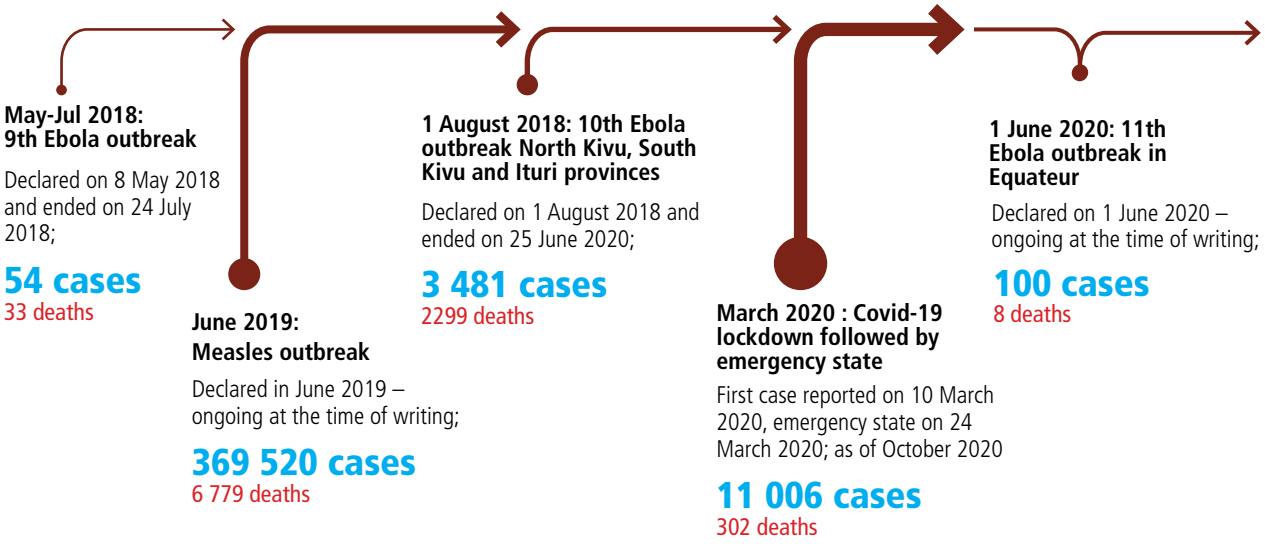
Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, which the World Health Organization (WHO) classified as "rare", has occurred mostly in parts of sub-Saharan Africa. It was first "discovered" in 1976 in two simultaneous outbreaks, one in what is now Nzara, South Sudan, and the other in Yambuku (near the Ebola River), in what was then Zaire (now the Democratic Republic of Congo) (WHO, 2020e). Since then, the virus has recurrently emerged from its natural reservoir and infected people in several African countries. Since 1976, the continent has witnessed small outbreaks almost yearly, with the largest Ebola outbreak to date having taken place between 2014 and 2016, with more than 28 600 cases being reported and 11 310 deaths. The outbreak started in Guinea and then moved across land borders to Sierra Leone and Liberia (WHO, 2020d).

Until recently, there were six known strains of Ebola virus, with the ***Zaire ebolavirus, Bundibugyo ebolavirus***, and ***Sudan ebolavirus*** being the species responsible for the larger outbreaks in Africa. The most recent – ***Bombali ebolavirus*** – was identified and reported in August 2018 (Forbes et al., 2019). Zaire ebolavirus, the most fatal strain, was associated with the 2013–2016 outbreak as well as the current ongoing outbreak in DRC (CDCP, 2019). The disease has an average human fatality rate of around 50%, varying between 25% to 90% in past outbreaks (WHO, 2020e). The fatality rate, however, is also determined and influenced by socio-political conditions: the highest fatality rates are to be found in Africa, while the rate for those treated in the United States has been 0%. Ebola causes kidney and liver function impairment and internal and external bleeding. Male survivors can be contagious for up to a year from the onset of symptoms. Pregnant women who contract acute Ebola and recover from the disease may still carry the virus in breast milk or in pregnancy



Adapted image. Source: CDCP, 2019

Figure 1: Map showing Ebola virus outbreaks by species and size, since 1976



Sources: WHO, 2020a; WHO, 2020c; Stop Coronavirus RCD, 2020

Figure 2: Timeline of EVD, measles and COVID-19 outbreaks in the DRC

related fluids and tissues, infecting the in-utero baby. Coming into contact with the bodies of the deceased can also lead to contracting the virus (WHO, 2020e). Today there are over 10 000 survivors of Ebola virus disease (WHO, 2020d).

The DRC experienced small but recurrent outbreaks of the EVD over the past three decades; the Centers for Disease Control and Prevention (CDCP) (2019) reports 12 outbreaks in the DRC since 1976. It managed to quickly contain these outbreaks in 2013 to 2016. But then the world's second largest Ebola outbreak on record broke in the eastern part of the country in 2018, striking in Beni and Goma in North Kivu, Chowe in the Mwenga territory of South Kivu, and in the Ituri Province. The last three epidemics followed one another over a period of three years and resulted in 3 481 cases, 2 299 deaths and 1 162 survivors (WHO 2020c). EVD was still running its course in these provinces when the COVID-19 pandemic appeared in the country. On 25 June 2020, the Ebola outbreak was declared over (WHO 2020h). The outbreak, almost two years long, was particularly challenging because it took place in an active conflict zone. The 11th Ebola outbreak was announced on 1 June 2020 after a cluster of cases was detected in the Mbandaka area of Equateur Province, which had also been affected by the 2018 outbreak[1]. At the time of writing, more than 5 000 vaccinations had been administered in that province (WHO, 2020f). Medical doctors regard EVD as having become "endemic"[2] to the DRC[3].

There is substantial evidence that several bat species can host EVD (De Nys et al., 2018). It can spread to humans through direct consumption of Ebola-infected bats or after consumption of fruits contaminated with saliva, urine or faeces from Ebola-infected bats (Leroy et al., 2007). However, other mammal groups (such as primates or duikers) could also host these viruses or play the role of intermediate amplifying hosts (Leendertz et al., 2016). The exact source and carriers of each Ebola outbreak over the last 30 years have yet to be ascertained with any scientific certainty (De Nys et al., 2018). However, what the science does show is that forest degradation leads to a greater chance of contact between humans and potential reservoir species. Locating the economic, social and political context of this degradation, and the shocks that contribute to it, is therefore important. Ebola outbreaks in humans are linked to hotspots of deforestation (Olivero et al. 2017;

1 Congo's National Institute of Biomedical Research (INRB) has found that the newly-identified Ebola virus circulating in the Equateur Province in the western part of DRC is different from the one that has infected more than 3 400 people in the eastern part of the country (WHO 2020g).

2 "An endemic disease in one location would be regarded as an emerging disease if it crossed from its natural reservoir and entered the human or animal populations in a new geographical area, or if an endemic pathogen evolved new traits that created an epidemic " (Kabash et al: 2012: 1937).

3 Dr Tambwe, medical doctor at the Virunga Foundation, interview, 7 August 2020.

Source: https://www.atlanticcouncil.org/blogs/africasource/below-the-surface-a-game-changer-in-congolese-politics/

Figure 3: Map of the Democratic Republic of Congo (DRC), showing the area of study

Rulli et al. 2017). Five of the eleven epidemics have emerged in the deep corridors in the forests of the Congo Basin, where the encroachment of human settlements[4] increases the chances of humans being exposed to hosts carrying the virus. However, especially in the Congo, greater human pressure on forest resources often occurs as a secondary result of much greater disturbances, which are extractive or industrial in nature. Ebola spill overs in different ways, and with different impacts in terms of human mortality, depending on the configuration of the forest edges and the size of the nearby human settlements, as EVD is a density-dependent pathogen.[5]

4 Dr Laudisoit, A, eco-epidemiologist and wildlife biologist, One Health, National Geographic Explorer 2019 interview, 25 August 2020.

5 This means that the virus needs many hosts to propagate. So, if a spill-over of the virus happens in the initial phase of habitat conversion, when there is a small pocket of human population and infrequent interspecies contact events, it will not lead to major epidemics. This was the case in previous outbreaks of Ebola in Central Africa, which remained circumscribed to small villages and caused few fatalities. However, in Guinea, when infected individuals went to urban centres to get treated, the ensuing chain of transmission sparked a major epidemic (Pigott et al., 2014).

Ebola and a **'perfect storm'** of compounding shocks

The zoonotic spill-over of EVD into humans and its expansion into an epidemic are shaped by political and social dynamics. As a set of shocks, the Ebola outbreaks can be seen as periodic culminations of ongoing, multiple underlying contradictions and processes.

The 2013–2016 West African Ebola outbreak, the largest the world has known to date, occurred in a context of countries that had been destroyed by decades of civil war. In the DRC, the ongoing conflict, historically closely linked to its mineral wealth, has played a major role in escalating the Ebola disease from a spill-over to an epidemic, and thence to a pandemic.

In Liberia and Sierra Leone, especially, armed conflict resulted in weakened health services and a chronic scarcity of health workers, a situation hugely exacerbated by IMF austerity prescriptions (Robinson and Pfieffer, 2015).

In eastern DRC, local populations have low levels of trust in authorities and many communities even denied that the virus exists. The outbreak of Ebola was met by a tardy and inadequate national and international response. Health authorities failed to communicate with the local populations adequately and early enough to ensure buy-in and cooperation to prevent further contamination. Most importantly, the virus spilled over into high-density areas, accelerating its transmission, which was also aided by high population mobility across borders (Pigott et al., 2014). Multiple chains of transmission were initiated as patients with unrecognised Ebola sought care at health facilities with inadequate infection prevention and control (Biedron et al., 2019). As we discuss in this paper, amplification of the epidemic found its roots in the chronic divestment in public health personnel and infrastructure.

Similar ingredients for a perfect storm could be found in our case study areas in the eastern half of the DRC, which comprises the provinces of North and South Kivu, Katanga, Maniema and Orientale (see Figure 3). With their vast endowment of natural resources, these areas have been battered by conflict and instability. Such areas are, indeed, hotspots for "war, political strife, social upheaval and displacement, natural disasters, and economic volatility" (FEWS NET, 2017).

The specific outbreak under study in this paper (the 2019 outbreak in eastern DRC) was the first to occur in an active conflict zone, and those who responded to contain the spread of the virus faced both widespread violence and active community resistance to containment and medical response measures. This Ebola-targeted violence, which was primarily driven by highly traumatised, forgotten and discarded civilians, was found to have the largest impact on increasing transmission of the disease. A total of 16 violent events recorded over a 21-day interval increased the transmission of EVD by a staggering 60% (Kelly et al., 2020).

Climate change exacerbates food insecurity and constrains an agricultural sector already under pressure

The hunger situation in the DRC illustrates the ongoing and compounding nature of shocks, of which Ebola was one important aspect. DRC's rich natural and human resources are being continuously and rampantly extracted, and, particularly in the eastern parts of the country, people experience high poverty levels that significantly affect food security and livelihoods (FEWS NET, 2017). Data from the National Statistical Data Institute (2014) points to poverty rates of 60.2% in South Kivu, 52.4% in North Kivu, 66.6% in Katanga, 56.9% in Orientale, and 62.9% in Maniema province. The country experiences the second highest rate of hunger in the world, in contradiction with its mineral wealth and closely linked with the associated conflict. The Integrated Food Security Phase Classification (IPC) for the DRC released in July 2020[1] reveals that more than 21.8 million people face high levels of acute food insecurity, "the highest number of people experiencing crisis or worse levels of acute food insecurity ever recorded in a single country" (FAO, 2020). Twenty-five years of conflict and displacement have directly affected people's ability to access their fields, manage and maintain their seed and food systems and trade their seed and food on local markets. Since 2016, approximately 6.6 million people have been living in a situation of displacement in the DRC (FAO, 2020).

Research conducted in 2018 found that of 181 countries evaluated, the DRC ranked as the 12th most vulnerable country to climate change, and that it was also the 5th least prepared to cope with its adverse effects (Government of the Netherlands, 2018). The climate crisis is likely to lead to increased crop failure due to heavy rains and flooding (Ludwig et al., 2013), aggravating the extremely tenuous food security situation (FAO, 2020). For example, in South Kivu, Tanganyika, Haut Lomami and Haut Katanga, heavy rains in April and September 2020 resulted in flooding that damaged food crops. Consequently, around 500 000 people lost almost all their food reserves. The occurrence of such flooding in the eastern DRC is predicted to increase with climate change. At the same time, temperatures on the 100-year horizon are also predicted to rise, with the occurrence of droughts during the rainy season expecting to double (Government of the Netherlands, 2018).

Climate change predictions indicate that the occurrence of livestock and crop disease in the country will also increase (SIDA, 2008), and a high prevalence of plant and animal diseases is hampering agriculture in the region (FAO, 2020). These include cassava mosaic disease and cassava brown streak disease (FEWS NET, 2017), which have been on the rise since the early 2000s (Nachigera et al., 2017). Banana ***xanthomonas*** wilt has also been on the rise in the eastern part of the country (FEWS NET, 2017). The endemicity of these diseases in parts of Eastern DRC has seriously compromised income earning and deconstructed livelihood strategies of local farmers (FEWS NET, 2017).

1 Covering the period July–December 2020

Compounding this extremely fragile and precarious food security situation is the onset and spread of the fall armyworm (FAW) infestation, which has taken root across the continent, inflicting extensive crop losses (see FAW report in this series). First reported in 2016, in the Equateur and Katanga provinces, crop losses caused by the FAW attacks on maize crops were estimated at 45% on average for the 2018–2019 agricultural campaign, and had resulted in a loss of 0.9 million tonnes of maize during the 2017–2018 harvest season (DRC, Ministry of Agriculture, 2018).

The negative impact of plant diseases on food security have been widely reported and anecdotally observed. Farmers have changed their livelihood strategies to include activities such as charcoal making and selling wood. The crisis in agriculture has led to some communities in North Kivu reportedly abandoning farming to pursue mining and more lucrative business ventures (FEWS NET, 2017). Farming communities are thus losing ancestral farming knowledge and skills, perhaps irrevocably, severing young generations from agriculture. These deep shifts in livelihood strategies as a result of wider structural factors will put greater pressure on forest edges, deepen encroachment and increase chances of contact with EVD host species.

Threat to DRC's seed sovereignty looming

The high occurrence of diseases in the country has also provided fodder for the drive to replace farmers' complex and diverse seed systems with a feeble range of "improved" corporate seed varieties. In the DRC, where the process of drafting a seed law has been on hold for over a decade, the United States Agency for International Development (USAID) Feed the Future project has been funding the development of new seed laws and establishing provincial seed councils to regulate the use of seed at provincial and village level. As these provincial seed councils are currently envisaged, they will give enormous power to seed companies to participate in policymaking and regulate local seed activities.

In the strictest interpretation of the draft Seed Law, the distribution of uncertified seed is a criminal offence, punishable by fines and subject to confiscation and destruction; and, at a provincial level, distributers may serve jail time. In a recent publication, the ACB (2020) explains how these draft frameworks criminalise farmers' seed and systems, and denigrate these as problematic and inefficient, and in need of being replaced. This is despite locally managed seed systems being accessible, diverse

Projections of future Ebola and other zoonotic spill-overs in Africa

Pigott et al. (2017) investigated the local, national and regional viral haemorrhagic fever pandemic potential in Africa. The four viral haemorrhagic fevers modelled are Crimean–Congo haemorrhagic fever, Ebola virus disease, Lassa fever, and Marburg virus disease. Epidemic potential varies within Africa, with regions where viral haemorrhagic fever outbreaks (Ebola) have previously occurred (for example, Western Africa) and areas currently considered non-endemic (for example, Ethiopia) both ranking highly. Chad, Somalia and South Sudan were found to be highly susceptible to any outbreak at subnational levels. Madagascar and Sudan were in the top 70th percentile or higher for outbreak receptivity.

Research also shows that climate change will exacerbate the emergence, resurgence and redistribution of infectious diseases globally (Wu et al., 2016). Zika, malaria and dengue fever are among those viral diseases whose recurrence is to be expected in the region, with a warming planet. Malaria transmission is predicted to move to higher altitudes in the East African Community region, while transmission will reduce in lowland, marginal transmission zones such as South Sudan (Leedale et al., 2016).

PHOTO CREDIT: COMMON FRONT FOR THE PROTECTION OF THE ENVIRONMENT AND PROTECTED SPACES OF THE DRC (FCPEEP), WHICH SUPPORTS THE ACTIVITIES OF THE BUGORHE AND MITI PEOPLE IN KABARE, SOUTH KIVU

and resilient. Their replacement and potential criminalisation could constitute a further threat to food security in the country, as commercial certified seeds currently available are not able to meet the nation's food needs, are expensive and are part of a technological package of toxic agricultural chemicals and inorganic fertilisers, making a bad situation infinitely worse.

Ebola and COVID-19, additional shocks to agriculture and food systems

In the Kivu provinces, food trading has historically been limited. Insecurity has disrupted the functioning of local markets, resulting in frequent shortages and higher prices for basic foodstuffs (Nachigera et al., 2017). Households are therefore extremely reliant on their own crop production, with an estimated consumption of own crops being as high as 65% (Nachigera et al., 2017).

This agricultural production in the research area,[2] however, was severely disrupted by the Ebola outbreak, a situation that was compounded by the responses to COVID-19. As these two crises overlapped, it proved challenging to disentangle, by means of interviews, the specific impacts of each individually. The last case of Ebola in eastern DRC was registered in April 2020; the end of the outbreak was declared 42 days after the last case. In March 2020, the government declared a national curfew to contain the spread of the coronavirus. More lockdown measures were badly received by local populations, which

2 The DRC's main crops vary by region, but maize and cassava are major staples, and most areas support livestock production. Wheat, beans, potatoes and cash crops (coffee, tea and quinine) are grown in the eastern regions (Ituri and North Kivu provinces). North Kivu is home to more than a fifth of the national cattle herd and is therefore the largest livestock farming region in the country after the Eastern Province. South Kivu is also a traditional livestock rearing province; it harbours over 90% of the beef cattle, sheep, goats, pigs and poultry of the country (UNDP and NEPAD, 2013)

were depleted due to conflict, EVD outbreaks, hunger, trauma, and stay-at-home orders for those who were in villages where EVD outbreaks were declared.[3] A local doctor thus remarked, "What Ebola had already done, COVID-19 came to ram it in further."[4]

Mwenga territory (South Kivu), which was heavily affected by the EVD and armed conflict,

Access to seed was also a huge constraint, as on average 44.6% of farmers source their seeds from the local market, with those on the smallest farms most reliant on such purchases

imports almost all goods from neighbouring countries (Rwanda, Burundi, Uganda, Tanzania) or from large urban centres such as Bukavu and Goma. In the mist of the 2018–2020 Ebola crisis, border closures and restrictions on population movements led to soaring food prices, exacerbating hunger and food insecurity. The closure of local markets and mass displacement of the population from affected or deemed at risk areas to more or less secure areas meant that those farmers from North and South Kivu who do sell to markets experienced tremendous difficulties in selling their produce.[5]

The EVD epidemic also disrupted the agricultural calendar and hampered production. Border closure and restriction of movement impeded work in the fields, such as weeding, which resulted in lower yields. Ploughing and harvesting were similarly constrained. Access to seed was also a huge constraint, as on average 44.6% of farmers source their seeds from the local market, with those on the smallest farms most reliant on such purchases (McGuire and Sperling 2016). As these markets closed, seeds were harder to procure.

During the EVD epidemic, local respondents, which included local village dwellers and medical doctors, testified that the populations of Chowe, Mwenga and Mangina, for fear of the rapid and accelerated spread of EVD, coupled with the conflicts spurred by armed groups in several villages, fled and abandoned their farms, including their crops, livestock, and market activities, in order to relocate to safer areas that were not yet affected by the disease.[6] The picture that emerged from local discussions was that many of the households were separated from their productive resources, and levels of household poverty rose. Fleeing populations would also have increased the risk of contagion to other areas.

Amongst the survival strategies adopted was reducing food intakes. Several households in Chowe, in the landlocked Mwenga territory, reduced their number of meals per day. Smallholder farmers that were interviewed were forced to eat seeds that had been saved for planting.[7] People increased their hunting, fishing and wild food gathering; they also sold the produce of their hunt. Even households who wouldn't normally consume bats (a key EVD reservoir species) started consuming them to counter food shortages.[8] The coping mechanisms described for the Ebola outbreak were extended by the COVID-19 outbreak.

The economic decline brought about by the COVID-19 lockdown measures further worsened the state of national level food insecurity. In March 2020, the Congolese government declared a state of emergency, closing all land and air borders, with the exception of food

5 Traditional crops cultivated by smallholders include palm oil, beans, cassava, corn, potatoes, sweet potatoes, onions, tomatoes, cabbage, sugar cane, coffee, cocoa, bananas, soybeans, peanuts, pineapples.

6 Patrick Asumani Songa, teacher, telephone interview, 1 August 2020; Pacifique Kambale, trader, interview held in Goma 3 August 2020.

7 Innocent Muganza, teacher and human rights activist, interview held in Kitutu, 5 August 2020.

8 Brigitte Mbilizi Wabiwa, cultivator, telephone interview, 1 August 2020.

PHOTO CREDIT: COMMON FRONT FOR THE PROTECTION OF THE ENVIRONMENT AND PROTECTED SPACES OF THE DRC (FCPEEP), WHICH SUPPORTS THE ACTIVITIES OF THE BUGORHE AND MITI PEOPLE IN KABARE, SOUTH KIVU

cargo. A nationwide curfew was also enforced. At first the measures mostly only impacted urban households, but as the state of emergency was declared, rural households also started suffering from increases in food prices (FAO, 2020). Our local research team investigated and compared prices of foodstuffs prior to and after the COVID-19 epidemic. In Bukavu, a 50kg bag of beans, which cost US$70 before COVID-19 was sold in Kitutu/Mwenga for US$210 (a 98% price increase) during the pandemic. Similarly, a 50kg bag of rice, which cost US$19 before COVID-19, was being sold in Kitutu/Mwenga for US$57 during COVID-19. Very critically, as Congolese smallholders procure much of their seeds on local markets (ACB 2020), access to this vital resource was heavily disrupted.

Women, especially, have been severely impacted by the restriction of movement and market closures brought about by the pandemics. Proportionally, a greater number of women are engaged in the informal sector (small trade, agriculture, dock work) to cater for their families. Women involved in the informal sector are commonly referred to as ***mutambula pipa*** (literally meaning ***"those who make a living with what they earn in the day"***) and traditionally earn very little income. Many of these women had to discontinue their subsistence activities.

The COVID-19 outbreak thus occurred in a society already deeply destabilised by Ebola, violence, climate change, and a never-ending food crisis. At the time of writing, over 11 000 COVID-19 cases had been registered, although with a low mortality of just over 300 (Stop Coronavirus RDC, 2020). The medical response to Ebola, combined with the lockdown measures in response to COVID-19, the most extensive measles outbreak on record, and the recurrent armed conflicts in the eastern part of the DRC, have, over the past year, plunged these communities into a shock of an unprecedented magnitude. We now turn to the underlying drivers of these shocks.

Drivers of deforestation and forest degradation

Historically, DRC was home to the largest contiguous expanse of tropical forests in the world, after Brazil. The Congo Basin Forest, of which two-thirds is located in the DRC,

represented 10% of all tropical forests globally, and more than 47% in Africa. The DRC's forest loss has been on the increase, with the country having lost 14.6 million hectares of tree cover between 2001 to 2019, equivalent to a 7.3% decrease in tree cover (Global Forest Watch 2020). Recent trends indicate that forest conservation is sliding off the agenda. President Félix Tshisekedi, who succeeded Joseph Kabila in 2019, has been criticised for his apparent leniency towards the rise of illegal trade in industrial logging concessions (Hecketsweiler and Freudenthal, 2019).

Industrial agricultural expansion destroying tropical forests in the Congo Basin

It is widely accepted that agriculture has transformed the face of the planet more than any other activity and is one of the main drivers of biodiversity loss (Barrcelos, et al., 2015; Foley, 2005; Green et al.; Phalan et al., 2013). It is estimated that 129 million hectares of forest globally have been lost since 1990 (Steinweg et al., 2016), and there is increased recognition of the direct link between deforestation, clearing forested land for industrial agriculture, climate change, and the concomitant ecological crisis. By 2014, an alarming 71% of global forest loss was driven by industrial agriculture expansion, for timber plantations, cattle ranching,[9] and mono-crop commercial plantations of cocoa, palm oil, sugarcane, rice and soya (Lawson et al., 2014).

Africa's share of world palm oil production has fallen from 77% in 1961 to less than 4% in 2014, due to the boom in the sector in Malaysia and Indonesia (Evans, 2019). However, Africa has today become the new frontier for industrial

9 The incidence of cattle production on deforestation in the tropics depends on the context. In the Amazon, farmers and ranchers count among the main agents of deforestation, with the raising of livestock occupying 80% of the deforested area (Greenpeace International, 2009), mostly as forest makes way for the cultivation of soybean to feed livestock. In the Congo Basin, cattle production is based on extensive grazing (Le Bec, 2015), which essentially takes place on savannah/pasture land. In the Congo Basin, DRC has known the highest increment in livestock production; more than doubling between 2000 and 2016 (World Bank, 2020). It is not to say that the expansion of livestock farming in DRC might not drive more deforestation (Tchatchou et al., 2015) but it is not comparable to the trends observed in South America, where meat production is export driven. In the DRC, cattle production is for the local or regional market.

palm oil production, with an estimated 22 million hectares of land targeted for conversion to palm plantations, much of it in West and Central Africa (Proforest, 2016) (see box below).

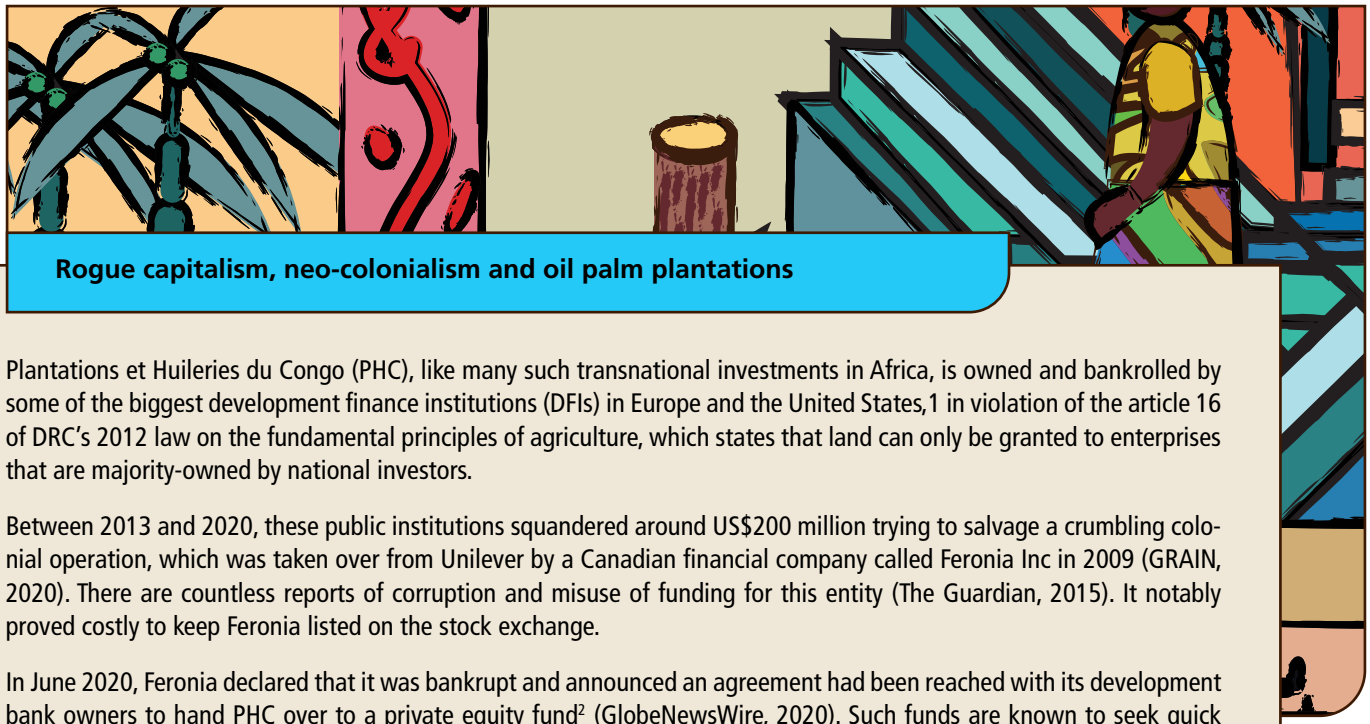
Speaking with local actors, we established that the expansion of plantations in this area (oil palm, coffee, cinchona, tea, sugar cane) has negatively impacted on local agricultural activities, slowly pushing small agro-pastoralists off the land. Other crops such as tobacco are also drivers of land use change in the region.[10] Consequently, small-scale farmers end up turning to paid work on mines in the region. Many smallholder farmers are either encouraged by big landowners to opt for monoculture production or to work as poorly paid and exploited labourers on these farms. These trends towards greater conversion of land for monocrops contribute hugely to eroding and undermining local food security and livelihood strategies.

Deep and extreme land use changes are particularly intense in the tropical regions of the country. This trend has been enhanced following the global food crisis of 2007/8, which led to a rush for land in Africa, with a wave of foreign companies entering to expand agricultural production using various investment methods (GRAIN, 2020). The opening up of primary forest by mining, logging, plantation development and oil and gas extraction (Karesh et al., 2012) was aided by financialisation – a phenomenon understood as the growing power and influence of global finance, aptly labelled "rogue capitalism" (Seufert et al., 2020). If the expansion of agribusiness and monoculture plantations has historically been associated with loans and credits from financial institutions, the pace and scale of finance capitalism in agriculture has reached new heights in promoting agriculture and dispossession of rural people and communities from their territories (Seufert et al., 2020). Plantations et Huileries du Congo (PHC), established over a century ago by European colonial powers and the owner of a 100 000 hectare oil palm plantation in the Equateur province, is illustrative of how the financialisation of agriculture has been playing out in the DRC, with capital flows organised as "share deals" going into the pockets of affluent investors, with no local beneficiation (see below).

Shifts in the agroeconomic context of continental Africa, seen as the last agricultural frontier in the word, appear to be a primary cause of zoonotic disease emergence. Robert Wallace in his book "***Big farms make big flu***" (2016) explains how the advent of global heath zoonotic diseases has more to do with the role that multinational corporations play in the developing world than what the food industry and neo-colonial-minded epidemiologists portray as the "dirty practices" of indigenous communities. This industrial production model is at the core of what Wallace describes as the "neo-liberal shift". In the specific case of Ebola, multinationals and "neo-colonial proxies" are believed to have driven the emergence of the 2013–2016 outbreak. "Every Ebola outbreak to date appears connected to capital-driven shifts in land use, including logging, mining, and agriculture" (Wallace, 2016: 330).

Let us learn more about the suspected ground zero of this outbreak, from an area called Guéckédou (Guinea), cited by Wallace (2016). Ambitious agricultural production in Guinea, including rice, coffee and palm oil, opened up vast tracts of land, including in forested Guinea, where other subsistence farming practices prevailed. The World Bank's 'enticing' policies proved instrumental in the development of this new industrialised agricultural regime, heralded as the only means to develop this part of Africa's "underused land reserve". Huge tracks of land were secured by agribusiness dealers from the United States, United Kingdom, France and China. This private development that results in "dispossessing smallholder farmers and traditional foraging grounds for mining, clear-cut logging, and increasingly intensified agriculture" (Wallace, 2016: 328) created a growing interface between humans and frugivore bats, known to be attracted to oil palm plantations. It is there where children would have come into contact with a contaminated bat. These agribusiness developments in West Africa were, according to Wallace's analysis, concomitant results of "divestment from public health infrastructure that permitted Ebola to incubate at the

10 Dr Laudisoit, A, eco-epidemiologist and wildlife biologist, One Health, National Geographic Explorer 2019 interview, 25 August 2020.



Rogue capitalism, neo-colonialism and oil palm plantations

Plantations et Huileries du Congo (PHC), like many such transnational investments in Africa, is owned and bankrolled by some of the biggest development finance institutions (DFIs) in Europe and the United States,1 in violation of the article 16 of DRC's 2012 law on the fundamental principles of agriculture, which states that land can only be granted to enterprises that are majority-owned by national investors.

Between 2013 and 2020, these public institutions squandered around US$200 million trying to salvage a crumbling colonial operation, which was taken over from Unilever by a Canadian financial company called Feronia Inc in 2009 (GRAIN, 2020). There are countless reports of corruption and misuse of funding for this entity (The Guardian, 2015). It notably proved costly to keep Feronia listed on the stock exchange.

In June 2020, Feronia declared that it was bankrupt and announced an agreement had been reached with its development bank owners to hand PHC over to a private equity fund[2] (GlobeNewsWire, 2020). Such funds are known to seek quick returns on investment and "exit" (cash in) their gains, often after stripping assets of the entity. This selling of shares on the part of Feronia is a sign of such an exit.

The lack of social investment in PHC, the ghastly treatment of workers reported by the local community, and its economic demise are symptomatic of how socially and environmentally destructive such financial models are. As the company filed for bankruptcy, it also abandoned parts of its plantations, allowing the original people of these territories to take back parts of their lands – now completely degraded. Nevertheless, these communities mobilised to realise the full potential of their land by introducing traditional and artisanal palm oil harvesting and production systems in Lokutu and Boteka (Farmlandgrab, 2020).

This case thus illustrates how foreign "investors" get around laws that limit foreign ownership of land and how they are able to shirk responsibility for land grabbing by partnering with local middle-men to secure land deals (Seufert et al., 2020). Financialisation and rogue capitalism need to be urgently reined in and the human right to land strongly and uncompromisingly enforced.

1 Refer to FIAN International et al. (2020: 58) for a full picture of the complex web of DFIs and other investors involved.

2 This fund is based in the tax haven of Mauritius and managed by Kalaa Mpinga, son of a former DRC prime minister and a major player in Africa's gold and diamond mining scene.

population level once it spilled over" (2016: 331). Thus, he concludes: "apparently Ebola did not fundamentally change, but West Africa had".

Wallace's (2016; 2020) "neoliberal disease emergence" analysis shows[11] that industrial agriculture, driven by the logic of capital, is key to the emergence of zoonotic diseases, as the traditional protective functions that natural ecosystems play in keeping viral loads at bay are being obliterated. In the DRC, this happens as these overarching forces of investment and extractivism push local communities further into breaching forest barriers as they seek to survive and eke out some livelihoods on the

11 Wallace (2020) also expands on the linkages between greater human-wildlife interaction and intensive livestock production. Global trends of factory farms expansion have been pushing smallholder farmers more and more on the verge of wildlife habitats, thus enabling the transmission of exotic pathogens from wildlife into food animals. Intensive meat production as another dynamic in the spill-over of disease is clearly acknowledged in the case of Asia and western economies and Wallace (2020) underlines that pathogen transmission from domesticated livestock by far outstrips pathogen transmission from consumption of wildlife. However, as this trend is less applicable in the African continent, with most of the continent's agricultural systems being based on extensive practices, we don't expand on this.

margins. Logging activities make the forest more accessible and vulnerable to anthropogenic pressure, including farmers who move in to cultivate the fertile soil as they pursue livelihoods in the perilous food security and agricultural context described above (Galford et al., 2015).[12]

Moreover, the recurring conflicts in DRC, linked to its mineral wealth, have exacerbated habitat destruction and the hunting of wildlife, as well as the overexploitation of natural resources. During the conflicts, refugees and displaced people would settle in marginal and vulnerable ecological zones, such as buffer zones of national parks. Large areas of protected areas and other forest reserves have thus been affected by land use change activities.

The Eastern Congo is endowed with the lion's share of the country's mineral wealth (see Annexure 1 for some background on the country's mining sector). There is a paucity of information on the role of mines as a driver of deforestation, and this deserves closer scrutiny and research.[13]

PHOTO CREDIT: L.WERCHICK

In terms of total forest loss, a mine can cause much greater damage using a large workforce and supporting infrastructure, according to a recent Center for International Forestry Research (CIFOR) working paper on Chinese trade and investment in the Congo Basin (Putzel et al., 2012). New settlements and increased mobility of people also lead to greater interactions between humans and wildlife (Karesh et al., 2012), which, as discussed, is a key factor in zoonotic disease spill-over. Furthermore, research has shown that, where land use is driven by these extractive processes, hunting of wildlife for

12 A high-ranking military man, General Gabriel Amisi is said to have acquired via his family company Maniema Union 2 – since sold to the Chinese operator Wan Peng International – an area of 36 700 km2 (an area comparable to that of the Netherlands) and equivalent to nearly a quarter of the industrial logging operations in the DRC. This was allowed to happen following the move by then Minister of the Environment, Amy Ambatobe, who ***de facto*** breached the 2005 presidential moratorium prohibiting new concession or reallocation of titles and who confiscated these licences from other logging companies without warning, to grant them to Maniema Union 2 (Global Witness, 2019).

13 Dr Laudisoit, A, eco-epidemiologist and wildlife biologist, One Health, National Geographic Explorer 2019 interview, 25 August 2020.

PHOTO CREDIT: JULIEN HARNEI

consumption often increases, as was the case in Northern Congo, where logging fuelled the increased hunting of wild meat (Poulsen et al., 2009). These larger forces of investment and extraction thus craft particular local dynamics of human-nature interactions.

The DRC offers an apt example of resource extraction and international capital investment as real drivers of degradation (and therefore zoonotic emergence) as well as particular national class interests. The field research conducted indicated that many of the concessions in the Mwenga territory are owned by local politicians and businessmen, who exert their political and financial influence to gain access to large swathes of land and natural resources in several forest areas. Rare species are logged, and the land is then converted to oil palm, coffee and cocoa plantations. These plantations are exploited by the local elites in conjunction with the mines. These large landowners often own land under the guise of the indigenous people, illustrating agribusiness' "exploitation of surrounding resource bases and peasant communities" (Liebman et al., 2020). Through these processes, a number of rural communities have effectively become landless and sources of cheap labour for extractive activities.[14]

By understanding and acknowledging these trends in resource extraction and international capital investment on the part of industrialised economies, we can see how disease ecology cannot be decoupled from an understanding of political, social and economic contexts (Liebman et al., 2020).

14 Mukunda Ramazani, C. Development practitioner and university teacher at ISAM (Institut Supérieur des Arts et Métiers), interview held in Kamituga, 7 August 2020.

The DRC's illegitimate debt driving ecological collapse and zoonotic spill-over

The history of the DRC's debt finds it roots in its independence in 1960, when its former colonial ruler, Belgium, managed to ensure that the newly sovereign state would assume a substantial part of the debts incurred during the colonial period (Nzuzi as cited in CADTM, 2018).[1] The country then contracted tremendous debt under the Mobutu regime, with the complicity of Western chancelleries and private creditors. In the 1970s, Zaire (as DRC was then named) received "development aid" as numerous loans from Western banks, regardless of the uses to which they were put (see Hickel, 2017). These loans contributed in large part to Mobutu's personal enrichment, totalling US$8 billion upon his death in 1997, or two-thirds of Zaire's foreign debt at the time. In 1999, the country's external public debt amounted to 284% of GDP (Kadazi et al., 2019) and in 2020 the debt reached $12.5 billion (Global Witness 2020).

Out of a total of US$14 billion in debt, about US$11 billion was cancelled in 2010 as part of the enhanced Heavily Indebted Poor Countries Initiative. However, this cancellation was granted under strict conditions, with donors (led by the World Bank and the IMF) imposing the liberalisation of the entire economy (CADTM, 2018). The debt cancellation therefore took place to the detriment of the population whose living conditions have clearly not improved, as education, health and road infrastructure are in a derelict state (Nzuzi as cited in CADTM, 2018). Local activists anxiously contemplate the prospect of the realisation of Inga III hydropower project on the Congo River, the cost of which could reach US$14 billion (CADTM, 2017) and which will have to be financed through further debt.

It is apparent that the prescribed conditions for DRC's debt cancellation relate to the country's weak capacity in public health care (see discussion below). By the same token, the continued emphasis on the extractivist sector to generate foreign revenues (as we explain further on, the country's 2002 mining law was strongly influenced by the World Bank) essentially means that the debt cancellation is linked to ecological destruction, a driver of disease emergence in Africa's tropics – a sort of debt-extractivism-disease nexus.

1 Meanwhile Belgium obtained a partial cancellation of its debt to the United States in compensation for the uranium supplied for the manufacture of the first two American atomic bombs dropped over the Japanese cities of Hiroshima and Nagasaki.

PHOTO CREDIT: BELEN B MASSIEU

Failing health systems and corporate profiteering from the Ebola crisis

The story of the Ebola pandemics in West Africa and in the DRC is therefore not just one of disease emergence, but speaks to much more fundamental causes. This includes the chronic divestment in public health infrastructure brought about by the lending policies of the International Monetary Fund (IMF) and World Bank. It also chronically exposes the extensive profiteering on the back of the Ebola shock.

Same old IMF dogma, aid displacement and crumbling public health

Decades of restrictions in the name of economic reform have stripped the health systems of Ebola affected countries of basic infrastructure. This divestment from public health infrastructure that contributed to the fast-paced spilling over of the EVD and other diseases in West Africa has been linked with decades of IMF lending to Ebola-affected countries. IMF conditionalities meant countries have had to prioritise repaying debt and interest payments over funding critical social and health services (Robinson and Pfeiffer, 2015), thus causing the "displacement of health aid': one of the ways the World Bank and IMF advance austerity is to advise recipient countries to keep spending low and instead divert aid, such as that for health, into reserves in order to counter-act the volatility of aid inflows (Stuckler et al., 2011: 67).

Thus, increased donor funding for health care, under the influence of IMF programmes, has reduced government's spending on health by as much as half when compared to government health spending that is not linked to implementing IMF conditionalities (Stuckler et al., 2011). The WHO, in turn, has been strongly criticised for making "top down" and "vertical" decisions that focus on "disease-specific campaigns", which further detract from developing a "horizontally integrated health service" (Clift, 2013: 24).

When Ebola struck the country, its health system was ill equipped to deal with it. Health-care centres were under-resourced and medical stuff not trained to handle the shock. The rural clinics also found themselves overwhelmed with patients, who often refused to go to Ebola treatment centres, perceived as places where people died.[1] Clinical laboratories of selected general hospitals surveyed in 2019 were found to be deficient in terms of infrastructure, basic and continuous training of personnel, equipment, supervision and quality control. Such deficiencies were found to hamper the technical ability of these laboratories to provide accurate diagnosis and treatment of diseases frequently encountered in these areas. The lack of coordination teams dedicated to the supervision and assessment of laboratories in the hospital

The weak public health infrastructure and the focus on the eradication of the EVD similarly made the response to COVID-19 challenging.

or even in the health zone is described as a serious deficiency, especially in the context of managing responses of zoonotic outbreaks. This recent research illustrates how health facilities are left under-resourced to deal with complex emergencies (Linsuke et al., 2020).

The weak public health infrastructure and the focus on the eradication of the EVD similarly made the response to COVID-19 challenging. In South Kivu, the manager of the central office of the Miti-Murhesa Health Zone indicated that several hospitals targeted to receive and treat people affected by COVID-19 were under-equipped and that the medical staff were demoralised and totally exhausted by the prospect of enduring yet another crisis.[2]

The country will also suffer from comorbidities associated with the handling of the coronavirus. A modelling analysis by WHO and other partners (WHO 2020i) indicates that severe disruptions to access to antimalarial medicines could lead to a doubling in the number of malaria deaths in sub-Saharan Africa in 2020 compared to 2018.

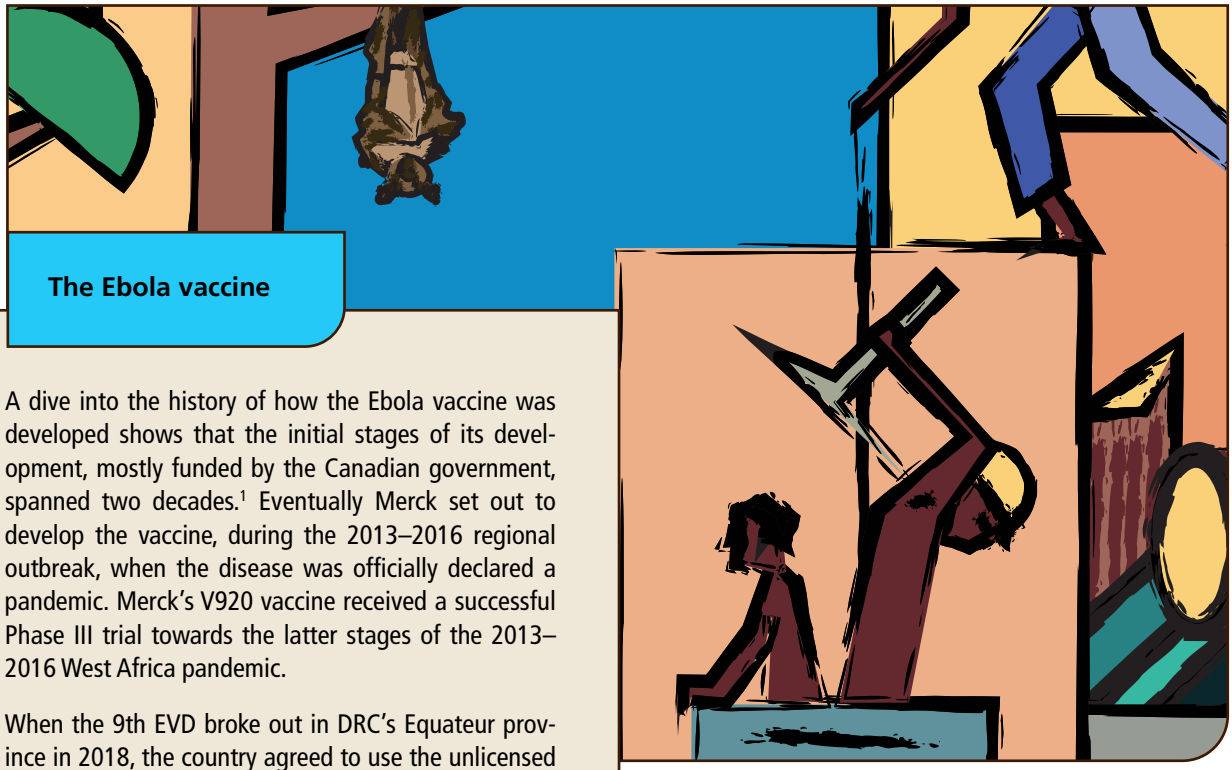
Global inequality and the global geography of disease

Ebola illustrates how global inequalities in access to quality health care and the bias and disease racism of international agencies play out when it comes to global disease management. It reveals the apathy of Western organisations, which tend to respond to viral outbreaks only when these threaten to reach their shores or when the perspective of a global epidemic concretises (Anne Laudisoit as cited in the Huffington Post, 2017), while diseases considered "benign" in Western nations (such as measles) can blaze through a country like the DRC, causing more mortality than Ebola, and remain ignored by the international community.

As Ebola reached epidemic proportions in West Africa in 2014, the global community realised that emerging infectious diseases once considered "tropical" in nature must now be considered global threats that can emerge in a remote location and appear as new clusters of infections in even the most distant settings a few days later. The search for an Ebola vaccine sped up when EVD was declared a global public health emergency (Henao-Restrepo et al., 2016). In 2014, when the first human Ebola case reached United States soil, NewLink Genetics, the holder of the Ebola virus patent (clinical trials hadn't began yet), saw the value of its stock double in just two weeks (Freudenthal 2019b) (see box below). As the race for a vaccine was on, so was the prospect of a windfall for its discoverer.

1 Uzima Vumi, J. Medical Director of Kamituga Central Prison, interview held via Skype, 5 September 2020.

2 Dr Ntaitunda Murhebwa, Administrative Manager of the central office of the Miti-Murhesa Health Zone, pers. com., 2020.



The Ebola vaccine

A dive into the history of how the Ebola vaccine was developed shows that the initial stages of its development, mostly funded by the Canadian government, spanned two decades.[1] Eventually Merck set out to develop the vaccine, during the 2013–2016 regional outbreak, when the disease was officially declared a pandemic. Merck's V920 vaccine received a successful Phase III trial towards the latter stages of the 2013–2016 West Africa pandemic.

When the 9th EVD broke out in DRC's Equateur province in 2018, the country agreed to use the unlicensed vaccine under a "compassionate use" protocol. It was first used in the early stages of an epidemic during the 2019 outbreak in north-western Equateur. The vaccine proved highly effective (with up to 97.5% vaccine efficacy) and the WHO recommended vaccinating people who were already infected with EVD to increase their chances of survival (WHO, 2019a). It helped contain the virus and bring the epidemic to a halt in under three months, with only 33 lives lost (Freudenthal, 2019a). Over 303 000 people were vaccinated in the 10th outbreak (2019–2020) but, as we discuss further on, this vaccination campaign in the eastern part of the country was thwarted by local people resisting the presence of the teams deployed to contain Ebola. In November 2019, Ervebo – as the vaccine is called – was approved by the European Commission; the first time it had been licensed by any regulatory agency (Baswell, 2020). In early 2020, the DRC, Burundi, Ghana and Zambia licensed an Ebola vaccine (WHO, 2020i).

1 Research initiated by the Canadian government in the 1990s to identify a new vaccine delivery system, eventually found the potential of a new method called vesicular stomatitis virus (VSV) that could confer immunity to Ebola. The Canadian government sold the patent to NewLink Genetics, which originally had an interest in developing a vaccine for Ebola and "was looking for assets to add to its portfolio to generate capital investment" (Jones, cited in Banswell, 2020). So, for many years the patent sat with Newlink Genetics. Then came the West African Ebola crisis. When the WHO declared Ebola a global health emergency, the Canadian government donated the vaccine to the WHO, which set out to find the right organisation to develop a vaccine. Merck was approached and the firm agreed to pay NewLink Genetics US$50 million for the license (Baswell, 2020).

The magnitude of the West African Ebola outbreak has not led to establishing a high level of global preparedness. Anne Laudisoit (cited in Harpignies, 2020) explains:

> *Because it was so well contained, and it hit so few people, and, I have no problem to say, because it hit so few white people that once the outbreak was contained governments didn't take it or other potential outbreaks seriously as a real risk to their people. The narrative was: It was well contained; we managed; we were heroes (US troops were sent in to help contain the outbreak), and we prevented it from coming to us, so why spend too much for an unlikely future threat?*

Thus in the context of weak public health systems and a continued dependence on the international donor community for disease responses, diseases that have been contained in the West but cause tragic mortality on the African continent, remain neglected by the international community. Measles, for instance, has in the past two years caused far greater mortality in the DRC, but has been completely side-lined by the focus of international and national agencies on the response to Ebola, resulting

in recurrent delays in the vaccination campaigns organised by authorities, which only rolled out in late 2019 (WHO 2019b). As of January 2020, 6 000 deaths have been reported (WHO, 2020a), making it the largest measles epidemic recorded in the world to date. The WHO reports a shortfall of US$40 million to extend the vaccination programme and reinforce elements of the outbreak response beyond vaccination (WHO, 2020a). Tragically, the efficacy of the vaccine gets weakened when it is transported across long distances to health-care facilities around the country, due to a lack of cold chain capacity. Hence, even vaccinated children can die of the disease (MSF, 2020), a crude illustration of how the derelict health-care structure of the country is failing the Congolese.

Profiting from a crisis: "Ebola business", a vaccine scramble and "pandemic bonds"

Corporate entities have enriched themselves through unethical practices, including access to and utilisation of Ebola genetic sequence information on open-source databases. Vaccine developers have received massive injections of public funding and will not disclose amounts invested in research in the development of the vaccine. The financialisation of the pandemic through "pandemic bonds" conceived by the World Bank has further entrenched the rule of corporate profit over health of Africans.

According to an undisclosed WHO report cited in an article by Hecketsweiler and Freudenthal (2019) in the French paper ***Le Monde***, over 269 000 blood samples were taken – including close to 24 000 positive samples – across Sierra Leone, Liberia and Guinea, during the 2013–2016 Ebola epidemic. Most of the samples were analysed on site by teams from Europe, the United States, Canada, China and Russia. But many of these were also sent to laboratories overseas, with affected countries having limited control over this traffic. The countries were like a "sifter" with a total lack of control exerted over the circulation of blood samples during the crisis. During this process, samples were lost and it is highly likely that many have been kept for further research (Hecketsweiler and Freudenthal, 2019).

The circulation of these samples has led to a merciless competition between researchers. The United Kingdom thus got hold of over 10 000 samples from Sierra Leone.[3] Some of the viruses isolated from the samples fetch more than 3 600 euros for 0.5ml (Freudenthal, 2019b). Yet none of that money made its way back to those in whose blood the virus' genetic material was found.

3 In 2019, the Centers for Disease Control and Prevention (CDC), the United States public health agency, took hold of all the samples stored in Guinea and transported them to the United States to irradiate them, rendering them harmless, and returned them to Guinea. The United States feared that the poorly secured vials, which were in storage in Conakry in freezers closed with simple padlocks, could be used for chemical warfare. In the process, according to Pierre Rollin, Ebola epidemiologist who supervised operations in Atlanta, medical and biological data was retrieved to "better understand the evolution of the disease" (Hecketsweiler and Freudenthal, 2019). The Liberian samples were, in turn, irradiated in Fort Detrick, where the National Institutes of Health, and the United States Army Medical Research Institute of Infectious Diseases (the branch of the military responsible for fighting the spread – accidental or intentional – of viruses such as Ebola) are headquartered. The original intent of creating a biomedical centre with these samples in Liberia was, thus, abandoned.

One of the most important collections of these samples (13 000) has been harboured at the Bernhard-Nocht Institute (BNI) in Hamburg (Germany). It is from this P4 (high security) research institute that a controversial drug was developed, purely based on the digital sequence information (DSI) (ACB, 2020; Equinet Africa, 2020) of an Ebola victim from Guinea that the BNI uploaded on GenBank, "no strings attached". It is from this DSI that United States-based firm Regeneron Pharmaceuticals developed a drug (REGN-EB3), thanks to a US$190 million investment by the United States government, keen to invest in "biodefense" drugs. The drug has been used in the 10th DRC outbreak and could in the future fetch over US$10,000 per dose (Hammond, 2019). But Guinea has been denied the right to benefit from this research, as the access to the genetic information as DSI meant that a material transfer agreement (MTA)[4] could not be entered. Ironically, according to the BNI director, these genetic materials remain the property of Guinea and will be returned "as soon as the country has adequate infrastructure" (Hecketsweiler and Freudenthal, 2019).

Up to the COVID-19 outbreak, the conditions for pay-outs to countries afflicted by pandemics had not yet been met.

After NewLink Genetics sold an exclusive licence to Merck (against the payment of US$50 million and royalties on any future commercial sales), the responsibility to develop and commercialise the vaccine effectively accrued to this multinational pharmaceutical firm. The United States Biomedical Advanced Research and Development Authority paid Merck US$148 million. The vaccine trial in Guinea also received nearly US$4 million from the United Kingdom biomedical research charity, the Wellcome Trust (Wellcome Trust, 2019) and more funding from the British Department for International Development (DFID) and the Norwegian and Canadian governments. Merck refuses to disclose the amounts it invested in developing the vaccine (Freudenthal, 2019b).[5] The lack of transparency surrounding the production costs and public money involved for this vaccine begs the question of whether Merck is set to gain from the vaccine in the event of future outbreaks.[6]

The World Bank has ensured that the financial markets get in on the action as well. It launched the Pandemic Emergency Financing Facility (PEF) in 2017, which aims to rapidly mobilise finance to low-income countries facing pandemics, through "pandemic bonds" (see box below). This has turned the pandemic essentially into an asset class. The bonds have been a source of enrichment, as investors cashed in on the regular coupon payments that they received on the back of the initial purchase (Sullivan, 2020). By mid-2019, the World Bank had paid US$114.5 million to private investors as coupons (Brim and Wenham, 2019). Prior to the COVID-19 outbreak, the World Bank's bond sale was reported to be 200% oversubscribed, as investors were attracted to the high-yield returns on offer (Sullivan, 2020).

It turns out that the 10th EVD outbreak that plagued the DRC did not meet the conditions to trigger payment of the pandemic bonds, as the disease had not spread across international borders, one of the requirements for PEF bonds to be triggered (see box below). This was despite the fact that more than 2 000 people died and it was the second largest outbreak ever recorded in the world.

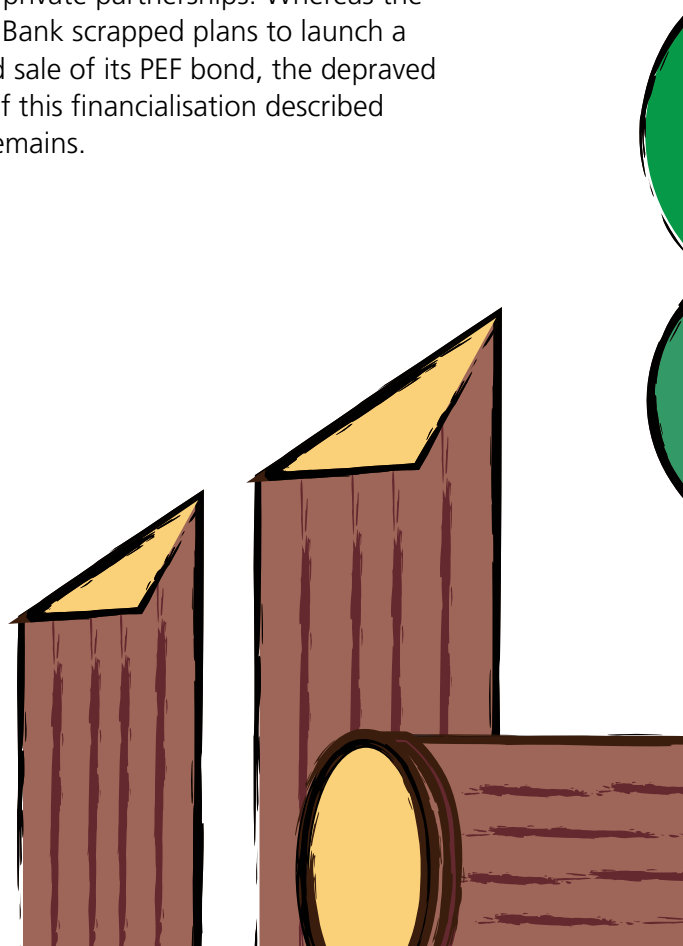
Up to the COVID-19 outbreak, the conditions for pay-outs to countries afflicted by pandemics had not yet been met. But with the onset of the coronavirus, investors started fleeing from these bonds as it became obvious that pay-outs to countries would materialise as the virus spread globally (Sullivan, 2020).

4 The Convention on Biological Diversity (CBD) and the Nagoya Protocol oversee the implementation of such MTAs to ensure benefit sharing with the country from which the genetic material is sourced. The Nagoya Protocol – whose purpose is to combat biopiracy – came into force on 12 October 2014, just a few months after the outbreak began.

How the pandemic bonds work under the World Bank's Pandemic Emergency Financing Facility (PEF)

In 2017, the World Bank sold around US$425 million worth of bonds and derivatives aimed at providing financial support to developing countries facing the risk of a pandemic. Investors who buy the bonds would only lose money if certain trigger conditions relating to a pandemic were met. If those conditions are triggered, the bonds are not repaid in full and the money is used instead to help tackle the crisis in developing countries. There are two categories of pandemic bonds: for class A, bonds will not be paid back to investors if there are more than 2 500 deaths in developing countries as a result of a pandemic. For the more risky class B, if the disease crosses an international border and there are at least 20 deaths in that second country, the investors' money will be paid to developing countries dealing with the outbreak. This instrument has since been terminated by the World Bank as pay-outs to developing countries during the COVID-19 pandemic were delayed and as some sought to quickly sell off their bonds as the pandemic worsened (Bretton Woods Project, 2020), abysmally illustrating how the scheme proved useless in fostering any preventative action.

Two things, therefore, stand out about the neo-colonial logic of these bonds. First, that under neoliberalism, nothing is out of bounds of commodification. The commodification of nature, conflict and integration into the global economy lays the grounds for pandemics like Ebola, while the abandonment of populations in terms of public health, linked to the neoliberal austerity psychosis of the IMF and World Bank, creates further opportunity for commodification and financialisation – neoliberal failures are seen as opportunity for more neoliberal medicines. Second, the bonds quantify death, devising how many deaths are deemed reasonable according to financial market metrics for the funds to be released. The death of brown people in poor countries was, therefore, financialised on the basis of returns to pandemic investors. Such, it seems, is the relationship between ecological degradation and the logic of health-care privatisation through the World Bank's vision of public-private partnerships. Whereas the World Bank scrapped plans to launch a second sale of its PEF bond, the depraved logic of this financialisation described here remains.



The failure of global forest governance to halt the global forest crisis

The alarming loss of forest cover globally, the drivers of which this paper has dealt with in the context of West and Central Africa and the relationship to zoonotic disease emergence, has led to on going efforts to preserve these forests.

Conventional approaches to forest governance focus on establishing and protecting private property rights, creating markets and mobilising private finance. These have failed to effectively and equitably address the underlying drivers of deforestation (Delabre et al., 2020). Despite the Paris Agreement's and the United Nations Sustainable Development Goals' emphasis on interconnectivity, and the adoption of global commitments to forest protection by public, private and civil society actors, deforestation and degradation continue unabated (Curtis et al., 2018), with 12 million hectares of tropical tree cover loss recorded in 2018, including 2.6 million hectares of primary rainforest (World Resources Institute, 2019).

Environmental problems such as climate change and deforestation have primarily been addressed as technological or engineering problems that can be solved by market-based instruments or through mobilising financial resources, as in the case of the Reducing Emissions from Deforestation and Forest Degradation (REDD+) and private forest governance (Delabre et al., 2020). Delabre et al (2020) argue that in fact the hegemonic "solutions" offered create socio-institutional lock-ins for global forest sustainability, resulting in serious barriers to socially just and ecological sustainable transformation. Such discursive, institutional and material expressions of power, based on historical colonial legacies, enable private investments and further exploitation of the world's forest resources (Delabre et al., 2020).

Market approaches are highly technical and bureaucratic, essentially handing over the responsibility of forest governance to private actors. The legacy of protected areas and forest-based carbon offsetting highlight the falseness of these "solutions." "Intensification solutions" to

deforestation and ecological degradation have been proposed, based on voluntary sustainability standards promising a "win-win-win" outcome of eliminating deforestation, boosting agricultural productivity and reducing poverty (Weber and Partzsch, 2018). This promotes increased productivity of export commodities and the exclusion of alternative systems to manage natural resources for the benefit of local citizens (Spann, 2017). The "politics of development" generates lucrative revenues for corporations, but also for politicians and their allies, particularly in the context of large-scale monocrop expansion. The Roundtable on Sustainable Palm Oil, for example, focuses exclusively on areas of High Conservation Value and High Carbon Stock, which creates loopholes for countries and corporates to continue to operate unethically and un-ecologically, and has disastrous impacts on local communities under the guise of conservation (WRM, 2020).

Zoonoses, a Trojan Horse of "fortress conservation"

This growing awareness in the global discourse that the destruction of wild ecosystems has been creating a "perfect storm for the spill-over of disease" (IPBES 2020) is fast becoming a Trojan Horse, spurring conservation agendas that are aimed at cutting people off from their resource base. Governments, industries, international conservationist NGOs and financial investors are amplifying their narrative of an expansion of protected areas worldwide as a "global solution" to what is described as separate climate and biodiversity crises.

National parks imposed as conservation enclosures have far-reaching impacts locally, ranging from land expropriation, social and political segregation, resource accumulation and wealth extraction, and militarisation of conservation practices (Beinart, 2000; Brockington and Homewood, 2001; Fairhead and Leach, 1996; Masse and Lunstrum, 2016; Marijnen, 2018; 2004; Peluso and Vandergeest, 2011; Titeca et al., 2020; Verweijen and Marijnen, 2018). This reproduces economic, social and political relations reminiscent of Africa's dark and oppressive colonial era (Titeca et al., 2020).

The conservation model has been shifting and evolving. National parks and environmental protection ministries sell and privatise conservation, with big conservation NGOs managing the areas and/or REDD+ projects; operating like quasi-state actors. Natural reforestation is a very long process, and therefore reforestation is often undertaken in practice through plantations, with carbon as the main measurement of success – deeply embedding this false solution to the crisis, and diverting attention from the structural and systemic issues.[1] REDD+ projects are untransparent, making it very difficult to assess and evaluate.[2] Further, the ambiguous and all-encompassing new narrative, nature-based solutions as part of natural climate and biodiversity crises solutions, is similarly deeply disconcerting (ACB and TWN 2020).

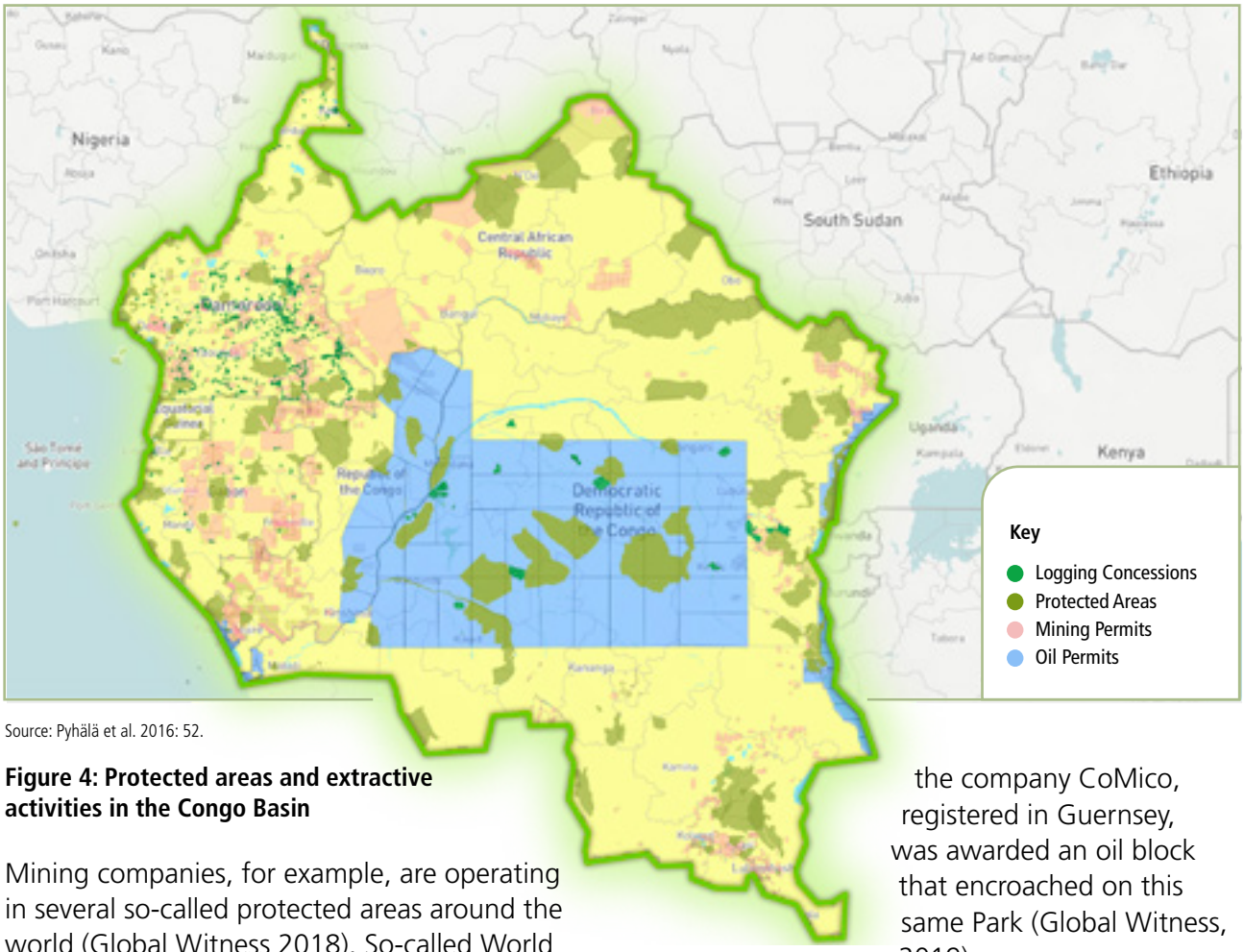
In this respect, the World Rainforest Movement (WRM) denounces what it describes as the "conservation industry's plan" to double the size of protected areas (WRM 2020), an intention also described as the Half-Earth Project.[3] WRM contends that the Convention on Biological Diversity (CBD) negotiations or the United Nations Paris Agreement are based on biased analyses of what is causing biodiversity loss and deforestation, or what might be driving this destruction. While sounding the alarm and promoting so-called "solutions" these very actors and forums continue to promote and facilitate the direct underlying causes of forest and biodiversity loss (WRM 2020) under the many guises of REDD+ offsets, ecotourism, Half-Earth ambitions and North-branded certification such as the Forest Stewardship Council (FSC).[4]

1 Teresa Pérez and Winnie Overbeek, World Rainforest Movement, telephonic interview 23, July 2020.

2 Teresa Pérez and Winnie Overbeek, World Rainforest Movement, telephonic interview, 23 July 2020.

3 Half-Earth Project is a "call to protect half the land and sea to manage sufficient habitat to safeguard the bulk of biodiversity". According to this theory, the fraction of species protected if 50% of the planet is placed under protection areas will be 85% (Half-Earth Project, 2020) with little consideration for issues of environmental justice and human wellbeing (Schleicher et al., 2019).

4 The FSC is an international system for certifying sustainable wood, which was found to have had minimal impact on reducing tropical deforestation and even helped greenwash illegal timber trafficking (Conniff, 2018).



Source: Pyhälä et al. 2016: 52.

Figure 4: Protected areas and extractive activities in the Congo Basin

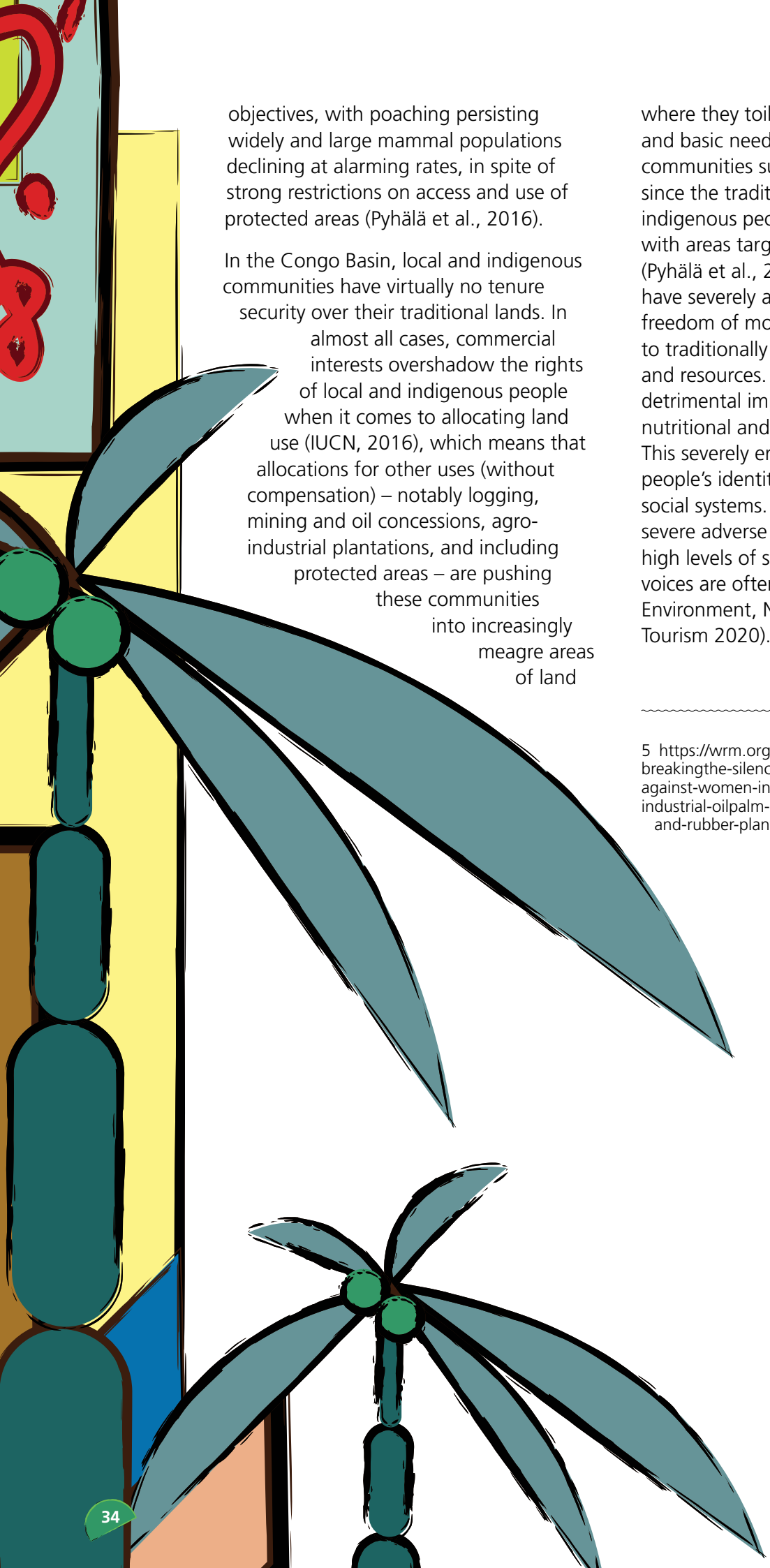
Mining companies, for example, are operating in several so-called protected areas around the world (Global Witness 2018). So-called World Heritage Sites are under threat in Venezuela, Mexico, Peru, DRC, Indonesia, Guinea, Cote d'Ivoire and South Africa. "The reality is that industrial-scale logging, mining, fossil fuel extraction and monoculture production have been destroying thousands and thousands of complex co-relationships and inter-dependencies in forests, including with and among forest peoples" (WRM 2020). Testimony to such abuses in the DRC itself is the opening of two national parks, Salonga (central part of the country) and Virunga (northeast), both of which are classified on the UNESCO world heritage list, to oil exploitation through ordinances issued by then president Joseph Kabila in late 2018. These declassifications happened in breach of the Congolese legislation on environmental protection and nature conservation, which prohibits all industrial activity in national parks. In the case of the Salonga Park, an exploitation concession has been granted to a South African company, Dig Oil Ltd, whose boundaries encroach on the Park (Hecketsweiler and Freudenthal, 2019). A similar episode had already occurred in early 2018 when the company CoMico, registered in Guernsey, was awarded an oil block that encroached on this same Park (Global Witness, 2019).

Figure 4 illustrates the overlapping and conflicting land uses allocated within and around protected areas in the Congo Basin. Many borders with logging concessions overlap with mining concessions or with oil concessions.

Conservation through dispossession in the Congo basin

In the Congo basin, the relationship between forest peoples and conservationists is largely conflictual. The Congolese state aims to formally protect at least 17% of the country's land area. About 11% of the national territory is currently covered by protected areas. Such projects use vast security measures to protect these areas, including violence against local communities, with women being the most vulnerable. Communities near many of these forests are prohibited from access and use of resources (IUCN, 2016).

Investigative research found that protected areas are failing to reach their own conservation



objectives, with poaching persisting widely and large mammal populations declining at alarming rates, in spite of strong restrictions on access and use of protected areas (Pyhälä et al., 2016).

In the Congo Basin, local and indigenous communities have virtually no tenure security over their traditional lands. In almost all cases, commercial interests overshadow the rights of local and indigenous people when it comes to allocating land use (IUCN, 2016), which means that allocations for other uses (without compensation) – notably logging, mining and oil concessions, agro-industrial plantations, and including protected areas – are pushing these communities into increasingly meagre areas of land where they toil to meet their subsistence and basic needs. Indigenous and local communities suffer disproportionately, since the traditional territories of indigenous peoples largely coincide with areas targeted for conservation (Pyhälä et al., 2016). These restrictions have severely affected people's freedom of movement, and the rights to traditionally use their territories and resources. It has had profound detrimental impacts on local food, nutritional and livelihood security. This severely erodes and undermines people's identity, culture, food and social systems. Women, especially, suffer severe adverse consequences, including high levels of sexual violence,[5] and their voices are often silenced (DRC Min. of Environment, Nature Conservation and Tourism 2020).

5 https://wrm.org.uy/all-campaigns/breakingthe-silence-violence-against-women-in-and-around-industrial-oilpalm-and-rubber-plantations/

Towards **systemic solutions**

The shocks we have described find their roots in structural imbalances. This paper calls for systemic solutions that place humans and ecosystems back at the centre, and halt the nefarious impacts of neo-liberalism sweeping across the continent, like a multi-headed Hydra.

National government must protect and respect the human rights of all its citizens, especially rights to land – particularly communal land tenure rights. It must desist from adopting fortress conservation agendas that do little to contain further extraction, exploitation and ecological destruction. Evicting indigenous peoples from protected areas prevents them "from doing what they have been doing very well [protecting biodiversity] and [they] are thrown out, to the eventual detriment of the landscape" (Corry, 2020). As those from the WRM describe, "There is no empty nature, there is no empty forest. Forests exist because people were taking care of the forest. Where there are still forests, it is because people are there."[1]

As Delabre et al. (2020) emphasise, lands held under formal and customary communal land tenure are often better protected and have lower rates of deforestation than state-owned or private lands. The effectiveness and appropriateness of individual rights in addressing deforestation is thus highly questionable (Blackman et al. 2017.; Ding et al., 2016.; Garrett et al., 2019).

There is a need to disrupt many of the persistent myths and neo-colonial policies that are related to international trade and investment and are implicit in national policies around land use, tenure systems and concession models (Galudra and Sirait, 2009; Ongolo et al., 2018; Peluso and Vandergeest, 2001). The false narrative of treating smallholders as inefficient, unproductive and driving deforestation must be solidly debunked.

In a similar vein, Liebman et al. (2020) suggest alternate modes of disease management that prioritise the livelihoods and dignity of people living in and depending upon forest ecosystems. An approach of integrating rural livelihoods and environmental justice celebrates the many forms of peasant, indigenous and smallholder agriculture that are integrated within forest ecosystems. These produce food and fibre for local and regional uses while preserving high levels of agricultural and wildlife diversity (Liebman et al., 2020). The recognition of

1 Teresa Pérez and Winnie Overbeek, World Rainforest Movement, telephonic interview, 23 July 2020.

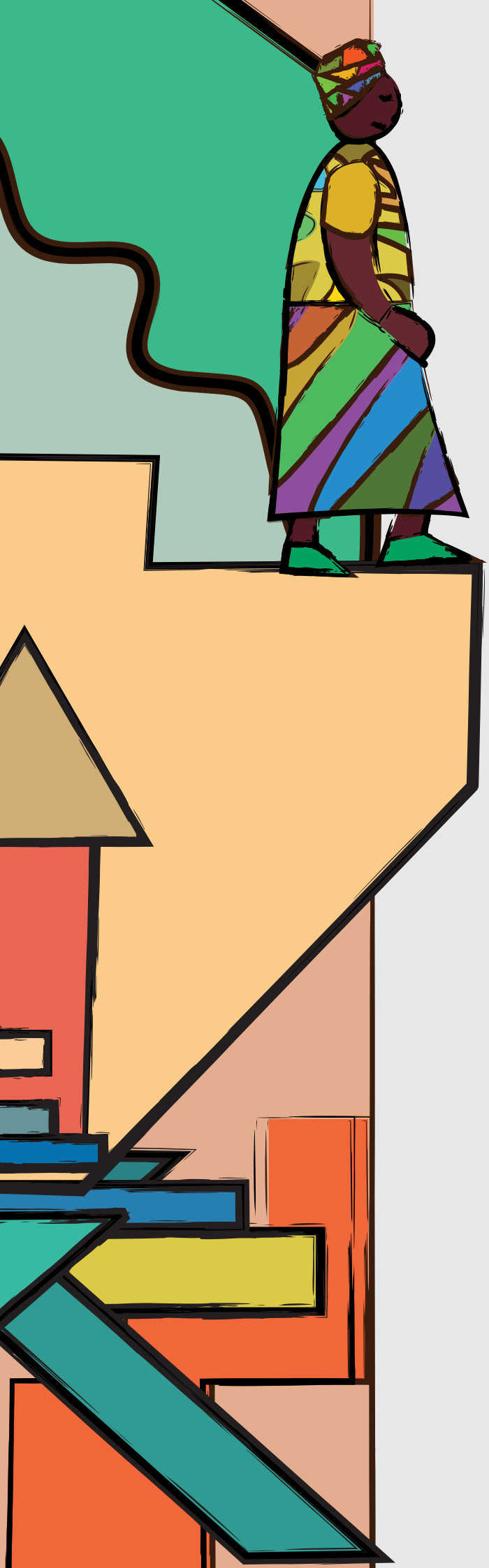
localised livelihood systems needs to be equally matched by an understanding of the role of global interconnections and structural causes in the emergence of diseases.

The current COVID-19 pandemic has given new momentum to the implementation of the One Health approach (UNEP and ILRI, 2020), which seeks to integrate the areas of human health, animal health and the environment. This approach seeks to understand increasing pressures within and between human environments, natural ecosystems and agriculture, selecting for specific diseases. While the bridges between human and animal health are easier to build, environmental health remains the weakest link in the triptych (Destoumieux-Garzon cited by Hecketsweiler and Freudenthal 2019) with knowledge of the links between forests, deforestation and emerging infectious diseases remaining fragile (Guégan et al., 2020). The limitation of the One Health approach, according to Wallace et al. (2015), is that it overlooks systemic sources of disease emergence and persistence. They therefore call for incorporating broader "structural inputs, including deep-time historical and cultural infrastructure and circuits of capital" in an approach called "structural One Health" (Wallace et al., 2015). The structural nature of the ecological crisis, and the fundamental imbalances in global systems it represents, cannot be addressed without incorporating the forces driving human-ecological interactions. It thus warrants an analysis of sources of capital and nations' financing of extractivist activities that cause deforestation, ultimately leading to this emergence of disease.

Consequently, "if landscapes, and by extension their associated pathogens, are globalized by circuits of capital, the source of a disease may be more than merely in the country in which the pathogen first appeared" (Wallace, 2016: 351). Global financial actors financing land grabs and deforestation have their share of responsibility in disease emergence. We need to call out the sovereign wealth funds, state-owned enterprises, governments and private equity actors that are wreaking havoc on Africa's land and forests as these diseases would not be emerging without the deep ecological disruptions we have described in this paper.

Projections exploring agriculture and forestry contributions to terrestrial biodiversity conservation show how options within the agricultural sector can contribute to 60–72% of conservation (Kok et al., 2018). Transformation is needed to happen at multiple levels. A paradigm shift from industrial agriculture to diversified agroecological systems is one part of the story. Both in the Global South and in the industrial world, this reorientation of food systems needs to be brought about in a manner that places biodiversity at the heart of agroecology, bringing back the "lining" offered by nature; in other words, these "place-specific agroecologies that, redefining biosecurity, [need to] reintroduce 'immune firebreaks' of widely diverse populations, species and varieties in livestock, poultry, and local seeds" (Wallace 2020).

However, to create the space for such practices, wider global drivers and their local manifestations also need to be confronted, as described above. Extractivist practices need to be fundamentally reduced. In the Congo Basin, our understanding of "relational geographies" (Wallace 2020) imply that in order to alleviate pressure for extractivist practices (agricultural and mining based), consumption patterns in the destinations of the products (mostly in the West) for which forests are being destroyed also need to be radically challenged and altered.



Conclusion

With the Post-2020 Biodiversity Framework under negotiation and the United Nations Summit on Biodiversity, 2020 is a significant year for biodiversity and conservation generally. Given the emergence of the COVID-19 pandemic, the urgency of these overlapping crises has been brought to the fore.

Countries affected by Ebola and multiple other shocks (hunger, climate, war, COVID-19) have been left reeling. These shocks find their roots in deeply systemic drivers that combine divestment in the public health sector, prompted by the lending conditionalities of international lending bodies, with the pervasive financialisaton of agri-business investments driving accumulation and dispossession. The Ebola shock and the response to it show the many ways in which such crises offer avenues for the enrichment of health actors, research laboratories, big pharmaceuticals and even pandemic speculators. In the DRC, the US$800 million invested in the Ebola response has not done much to support the country's public health system, which remains chronically deficient and unable to manage outbreaks of common diseases such as measles, which proved far more lethal nationally than the latest and current Ebola outbreaks.

The world is coming to realise that the occurrence of such global pandemics will likely increase unless ecosystem destruction is brought to a halt. Models have been developed to predict future risks of zoonotic disease emergence. Risks are high in tropical forest regions that are high in mammal biodiversity, and that are experiencing anthropogenic land use changes related to agricultural practices (Allen et al., 2017).[1] Even areas currently considered as non-endemic to Ebola today, may be affected by the disease in the future (Pigott et al., 2017). DRC is one of these disease hotspots, and yet the surge of resources that pour in, in the event of an Ebola outbreak, fails to materialise in sustained veterinary research and monitoring to understand the origin of the disease reservoir.[2]

African countries and their governing classes have to assume their share of responsibility in deciphering the plurality of actors involved in driving deforestation leading to disease emergence. Social variables and human-ecological interactions in the Congo Basin are complex. The DRC's intention to embark on agricultural intensification is of grave concern. The financialisation of the DRC's deforestation and forest degradation through capital venturing in industrial plantations must be disallowed and severely sanctioned. Customary communal land tenure rights must be restored, and illegal industrial occupation of land terminated, with the land handed over to communities that are appropriately supported in its management and in their livelihood activities.

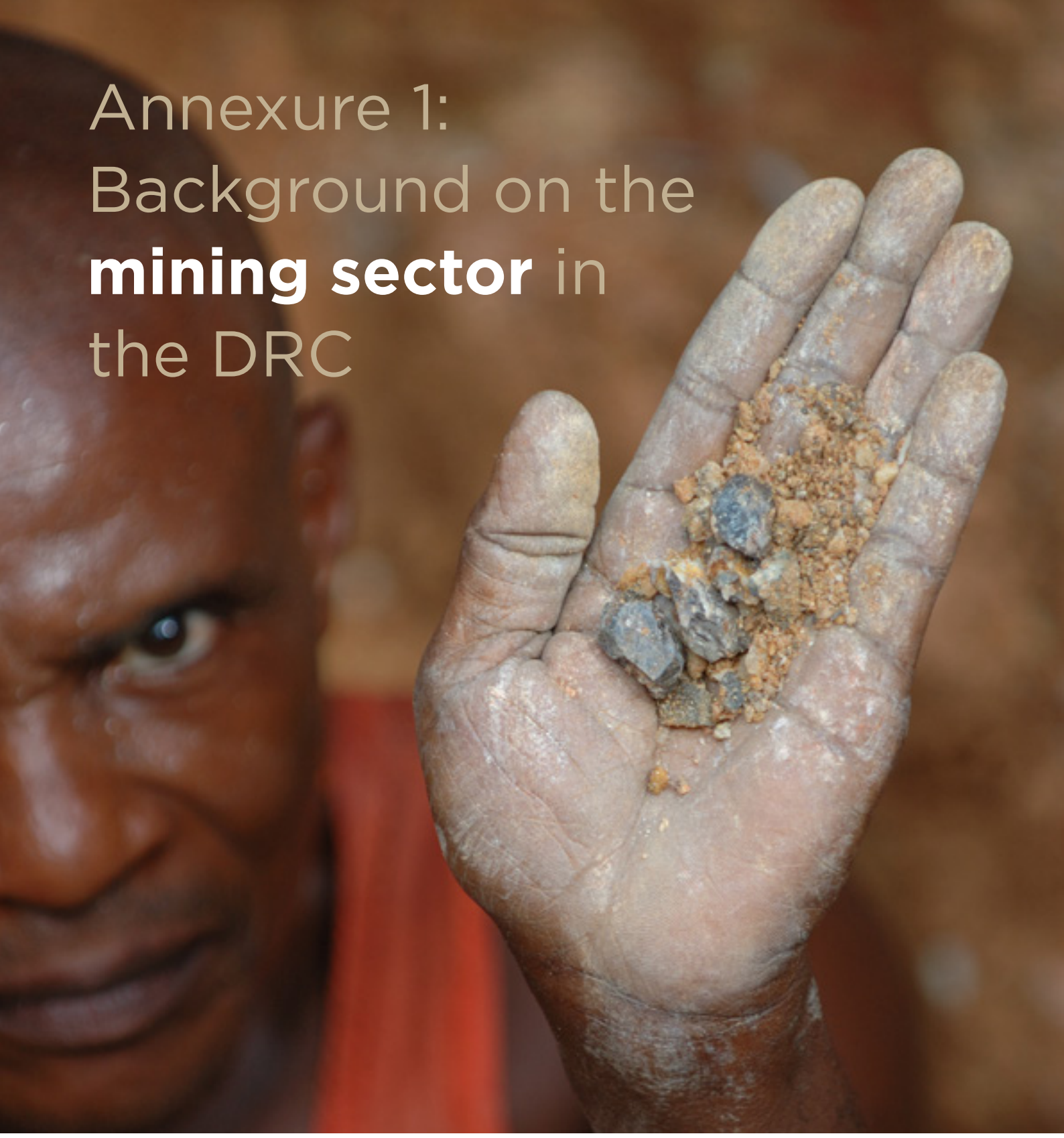
This research calls for structural changes in the global economy that subordinates and exploits countries like the DRC. Addressing pandemics, forest degradation and deforestation should be de-linked from financialisation and speculation and should be addressed through reinvigorated processes of internal democratisation, economic transformation and capacity building in state institutions and civil society.

Much can be done to avert over-reliance on lending, starting with reigning in capital flight, which has skyrocketed on the continent over the past two decades and which puts a tremendous drain on financial resources. It is critical that the granting of loans to the DRC be de-linked from resource extraction. The global economic architecture must come under immediate review and reform.

For the DRC in particular, new systems must be designed by its peoples. These must be grounded in human rights, farmers rights and environmental justice; especially forest dwellers and small-scale food producers.

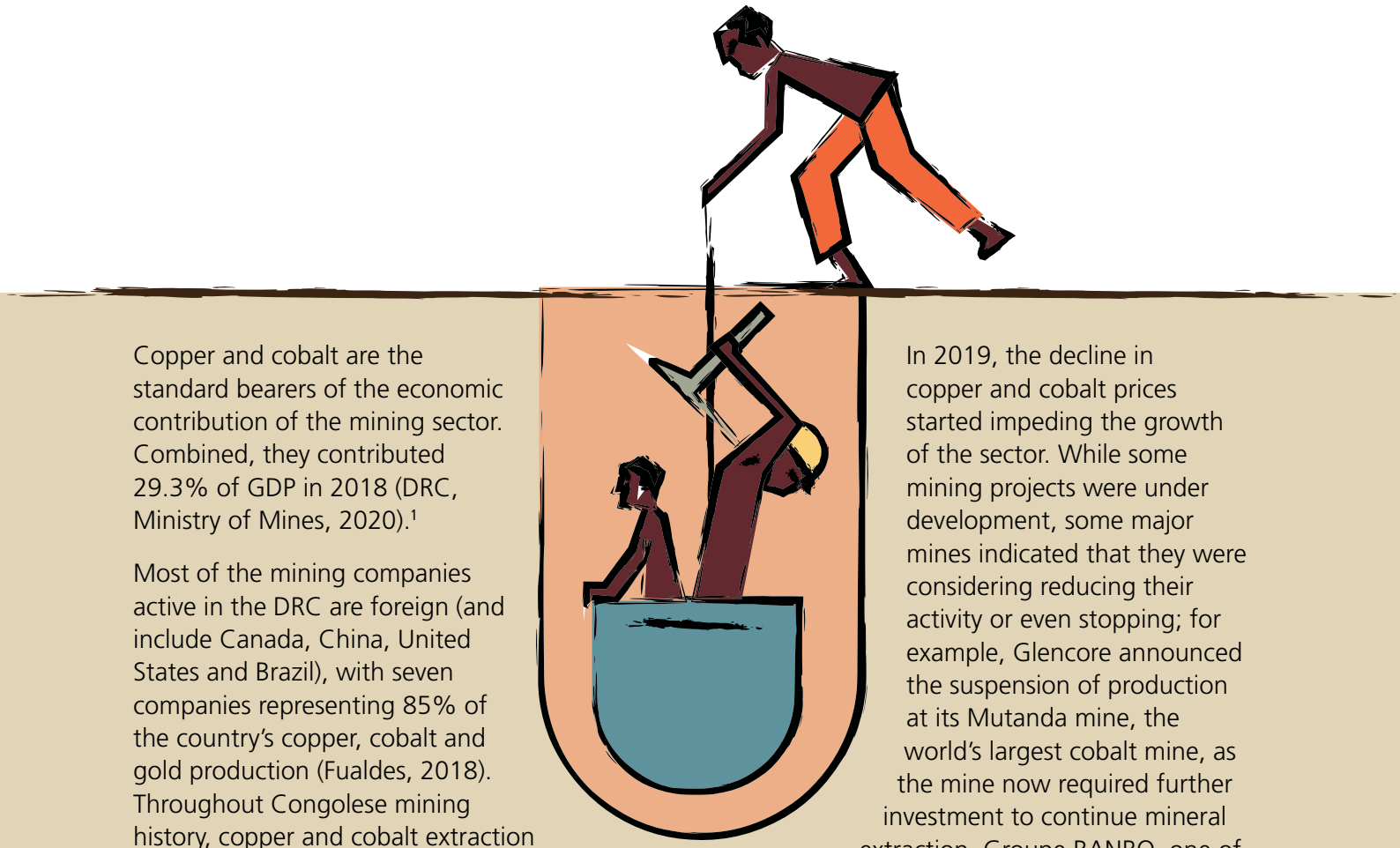
1 See http://www.globalviromeproject.org/

2 Dr Laudisoit, A, eco-epidemiologist and wildlife biologist, One Health, National Geographic Explorer 2019 interview, 25 August 2020.



Annexure 1: Background on the **mining sector** in the DRC

The DRC has abundant mineral resources (copper, cobalt, coltan, gold, diamonds), mainly located in the eastern and southern parts of the DRC. The 2002 mining code (inspired by the World Bank) explains, to a large extent, the growth sector (DRC, General Directorate of the Treasury, 2020), which contributed to 95.8% of total exports revenue in 2017 (DRC, Ministry of Mines , 2020) and a quarter of total employment in the country that same year (EITI, 2017).



Copper and cobalt are the standard bearers of the economic contribution of the mining sector. Combined, they contributed 29.3% of GDP in 2018 (DRC, Ministry of Mines, 2020).[1]

Most of the mining companies active in the DRC are foreign (and include Canada, China, United States and Brazil), with seven companies representing 85% of the country's copper, cobalt and gold production (Fualdes, 2018). Throughout Congolese mining history, copper and cobalt extraction has been carried out on an industrial scale by (semi-)public and private companies. The decline of the Congolese industrial mining sector after many years of mismanagement, wars and crises in the 1990s led to the expansion of artisanal copper and cobalt mining. With the gradual recovery of the industrial mining sector and the new dominance of the private sector, particularly over the last decade, cobalt in the DRC is now mainly extracted as a by-product of industrial copper mining. However, a fair share of copper and cobalt extraction continues to take place in the less regulated artisanal and small-scale mining sector. As the high cobalt prices and the resulting income potential increased from 2016 onwards, an increase in artisanal production has been recorded, with significant migratory movements (Bundesanstalt für Geowissehschaften und Rohstoffe, 2019).

In 2019, the decline in copper and cobalt prices started impeding the growth of the sector. While some mining projects were under development, some major mines indicated that they were considering reducing their activity or even stopping; for example, Glencore announced the suspension of production at its Mutanda mine, the world's largest cobalt mine, as the mine now required further investment to continue mineral extraction. Groupe BANRO, one of the main gold mines, decided to suspend production in South Kivu and Maniema due to the security situation, as there had been attacks by rebel groups on several of its sites (DRC, General Directorate of the Treasury, 2020).

These shutdowns took place in a context of tension between the major mining operators and the state. Indeed, while the 2002 mining law was deemed very favourable to the mining industry, the new mining law, promulgated in March 2018, is less so. Large foreign companies established in the DRC have tried to oppose some of the measures adopted, which offer less advantageous taxation, higher royalty rates, greater state participation, and compels industrial mining companies to spend part of their revenue on community projects while allowing them to subcontract work to artisanal mining cooperatives (DRC, General Directorate of the Treasury, 2020). However as the slowdown induced by COVID-19 started impacting the economy of the country, the Congolese authorities suspended the VAT exemption granted to mining operators in the DRC and requested them to repatriate 60% of their foreign exchange earnings to stabilise the local currency (La Tribune Afrique, 2020).

1 The economic slowdown brought about by Covid-19 lockdown measures from March 2020 led to a drop in demand for copper and cobalt, value chains that are dominated by China. The Think Tank Congo Challenge predicts a 20% annual decline in government revenues from copper, cobalt and oil, excluding revenues collected by state-owned companies (***Business Human Rights***). The DRC's economy has also been weakened by a sharp currency depreciation.

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