

Cobalt in the Democratic Republic of Congo: The cost of innovative technology
and historical lessons in global economics for a more ethical future

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Abstract

This paper focuses on the geologic and political history of the DRC and the effectiveness of existing legislation, including the Dodd Frank Act, and propositions for the Katanga mining sector, more specifically the mining of cobalt. Cobalt mining has also come under scrutiny with human rights groups, as Amnesty International released a report in 2016 finding that child labor and unsafe conditions were present in cobalt mines in the Katanga region. Cobalt is projected to continue to increase in value as the demand for EV and lithium-ion batteries increases (although recycling techniques and different types of lithium-ion batteries are being explored by manufacturers as an alternative to mining cobalt). This paper analyzes the legacy of colonialism in Katanga through a comparison with Chile, and the parallels between their histories and the corruption of their state mining companies. Through this lens, it can be seen that a different strategy can be employed in this region than with coltan in North Kivu, as the primary strategy of the Dodd Frank Act was to reduce violence by decreasing the size of the black market. Rather, business strategies can be employed that can be used to benefit the people of the Congo, as has been observed with CODELCO, the state mining company of Chile. Despite years of bloodshed from ethnic violence and political instability, the DRC shows signs of hope, as the first peaceful transition of power since their independence in 1960 occurred in 2019, and the chairman of Gécamines, the largest state mining company, announced that it would be changing and improving its business model and infrastructure beginning in 2019. The DRC has been called cursed for its geology, but rather it is cursed by colonial politics, greed, ethnic violence, and economic disadvantage. The geology of the region, and the necessity of minerals in a clean energy transition will not change. Perhaps this region's natural resources can be used to promote development and peace, with the wellbeing of the Congolese people as a central focus.

Keywords: geology, cobalt, Democratic Republic of Congo, Gécamines, due diligence, extractive industries economic policies, colonialism, lithium-ion batteries, stratabound copper deposits, secondary mineralization

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Introduction

As a person with a degree in geology, I cannot help but notice the intersection between the physical processes that have led to the formation of earth as we know it and the materials that enable human technology and innovation. The geographic origin of these materials in their raw state are determined by geologic processes that in many cases started before dinosaurs even walked the earth. However, in the past few hundred years, the mining industry has played a critical role in shaping international relations, politics, and global trade.

The mining industry in central Africa came to attention in the international stage following reports from Amnesty International and other entities condemning the use of the minerals coltan, tungsten, and tin sourced from the Democratic Republic of Congo, because of human rights abuses and links to local militias. The term “conflict minerals” came into being as the demand for these minerals increased as they were used in cell phone batteries—a rapidly growing industry in the mid 2000’s. This prompted a wave of international and national legislation aimed at increasing transparency in global supply chains. Among these legislative acts was the Dodd Frank Act, passed by the US Congress in 2008, which had the goal of decreasing the violence in the eastern provinces of the Congo by decreasing the flow of capital into the black market (Whitney, 2015). International associations and regulators enacted due diligence practices to better track the sources of materials so that international manufacturers such as Apple and Samsung could assure their customers that buying their products would not in any way support the ongoing violence in the Congo.

While the artisanal coltan mining sector and violence continues to be a problem for the eastern provinces of the Congo, the coltan from the Congo actually only constitutes a small portion of the world’s reserves of coltan. Therefore, it is easier for industries to source their

coltan from elsewhere to comply with due diligence practices. However, in recent years a different mineral sourced from the Congo has become increasingly important in industry and global trade— cobalt.

The cobalt mining sector in the Katanga region of the Congo has been important in global supply chains after it was “discovered” in the DRC in 1914, then a colony of Belgium. Cobalt in the Congo was produced as a byproduct of the smelting process of copper, and the Congo produces about 60% of the world’s cobalt. Cobalt became important in technology following a patent for the first cobalt-based alloy in 1912 called stellite, and in WWII 70% of aircraft blades and turbines were made of this alloy, as it is resistant to wear and tear from machinery. Cobalt was also important for the manufacturing of magnets, and also had uses in radioscopy, the sterilization of medical equipment, among other things (“Cobalt Material” 2019).

In the past decade, the market price for cobalt has increased dramatically because of its use in lithium ion batteries, a part of smartphones, laptops, and electric vehicles. With international pressure to transition to green economies, the market for electric vehicles is growing rapidly. The most expensive part of lithium ion batteries is cobalt, and it makes up about 15% of the total battery. As the Congo is the world's largest supplier of cobalt, it is central to the international scramble for cheap cobalt as the demand for technology continues its incline. Consequently, it was recognized as “critical” by the EU in 2011 and strategically important in the US shortly after.

However, the cobalt mining industry has come under international scrutiny in the past few years. The overarching company that holds a 75% stake in Katanga Mining Ltd, Glencore, is currently under criminal investigation in the US, UK and Switzerland for dealings with Dan Gertler, a billionaire from Tel Aviv. Dan Gertler likewise has been sanctioned by the US since

2017 with accusations of corruption because of his close friendship with Joseph Kabila, the former president of the DRC who still holds significant political influence (Moshinsky, 2015; US Department of the Treasury, 2017).

Apart from the large scale mining companies, the small scale or artisanal mining sector has been accused by Global Witness and Amnesty International of poor working conditions and use of child labor. However, for the Congo, the artisanal mining sector, where miners work on a subsistence basis and sell directly to Chinese smelting companies in open markets, provides the Congolese with employment and a way to support themselves in a country so ridden by war.

The mining sector continues to generate revenue, the value of cobalt exports from 2020 alone are estimated to be worth \$3.4 billion, according to the spot price of cobalt and the recorded amount of cobalt exports from the DRC. Despite the worth of their minerals, the Democratic Republic of Congo continues to be impoverished, with 70% of Congolese citizens making between \$1-2 a day (“Undermining Sanctions” 2018). Meanwhile mining industries in other countries have been used as a means to promote development and provide employment, including those with a similar colonial history and challenges as the DRC. CODELCO, the state mining company of Chile, following a nationalization process in the early 70’s, was able to use its copper mining sector to develop its national economy and contribute to the wealth of the state with overall success, albeit following a dictatorship.

I think that the largest challenge the DRC faces is that of misallocation of funds and lack of infrastructure to protect itself from the manipulation of powerful international businessmen. The demand and importance of cobalt in industry is not going away, and because of the importance of the DRC as a source for cobalt, large manufactures will continue to work with mining companies with operations in the DRC. What I propose in this paper is business

strategies and international economic policies that ensure that the profits of the cobalt mining sector in the DRC actually benefit the Congolese people and are utilized to enable long term development in the country.

I hope also to provide a geologic perspective on the value of these minerals that were formed in quite specific conditions. Often economic policies and business structures are founded upon the assumption that resources are unlimited. As will be displayed shortly, this is not the case. Perhaps this perspective can inform policies that treat minerals with a bit more reverence—with how they are used and how they intersect with the lives of seemingly disparate people and nations across the globe. But one step at a time.

Part 1: Geologic History

It is first important to discuss the geologic processes that formed the copper-cobalt belt in south eastern Congo and Zambia, of which there is so much increased interest due to the use of cobalt in lithium ion batteries, among other industries. A study was conducted by the United States Geological Survey in 2010 as a part of an effort to better quantify global mineral resources and to estimate the size of unknown copper deposits in the region. Most of the information relayed in the following pages is a summary of this report (Zientek et al, 2010). Additional explanations have been given from a general background in geologic studies.

While the whole of this paper deals with the application and legislation surrounding these natural resources, it is important for context to understand the geologic processes that brought about these minerals. Perhaps in conveying the time involved on a geologic scale necessary to form these minerals, this perspective can inform how these resources are treated in legislation and in industry.

The geographic study area in this paper is Central African Copperbelt, a 700 km long arcuate trend which extends from the southeastern part of the Democratic Republic of Congo, referred to as the Katangan or Shaban Copperbelt, to Zambia, referred to as the Zambian Copperbelt. Some discrepancies are present in the naming of geologic units in this area due to the differences in the geologic surveys in the DRC and Zambia, as the publications in the DRC were published in French (as they were conducted primarily by Belgian mining companies) and the geological survey of Zambia published results in English. While the first written record of the presence of minerals in this region were recorded in the early 19th century in the travel diary of Pedro João Baptisma, archeological findings suggest that malachite outcrops were mined as early

as the 4th century A.D. In addition, indigenous peoples may have smelted at least 100 thousand metric tons of copper.

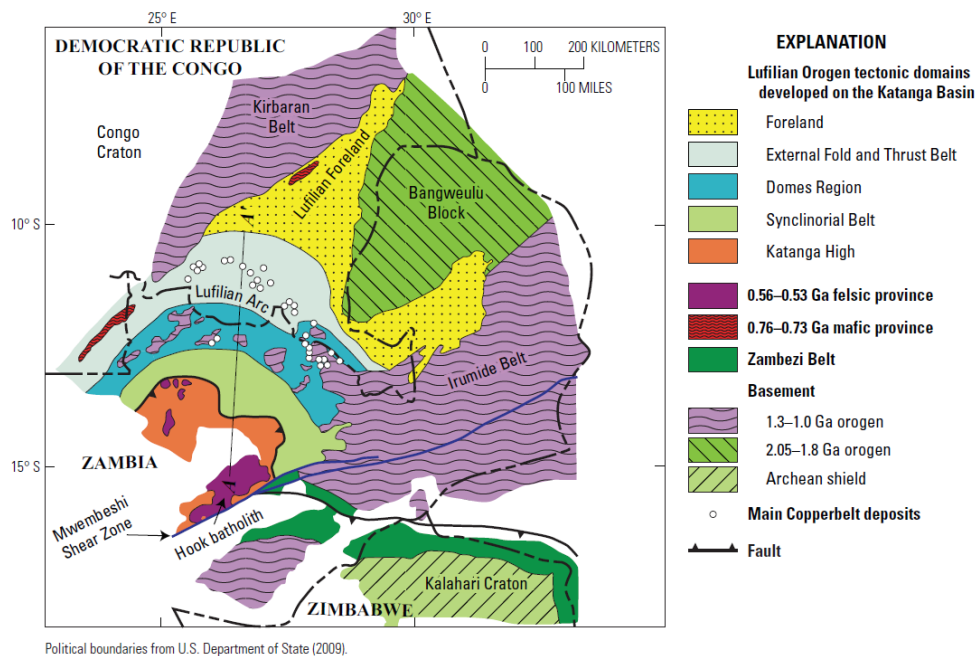


Figure 1: Geologic map from Zientek et al 2010.

For clarification of terminology, a deposit is defined as a mineral resource, as proposed by the Committee for the Mineral Reserves and Reporting Standards in 2006, when there are “concentrations or occurrences of material of economic interest in or on the Earth’s crust in such form, quality, and quantity that there exist reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity, and other geological characteristics of mineral resources are known, estimated, or interpreted from specific geological evidence, sampling and other knowledge. The term “mineral reserve” is restricted to the economically mineable part of a mineral resource.”

Copper can be found in different types of geologic settings, and the mechanism in which copper was produced in this setting is referred to as sediment-hosted stratabound copper. This means that copper is found in sedimentary rock, a rock that is formed from the deposition and

compaction of sediment over geologic time. Stratabound means that the copper is constrained to a layer (stratigraphic unit) of the sedimentary sequence. These deposits “consist of fine-grained, copper- and copper-iron-sulfide minerals that form stratabound to stratiform disseminations in siliciclastic or dolomitic sedimentary rocks” (Zientek et al 2010). These deposits are formed from late diagenetic fluids generated during the compaction and lithification of sedimentary basins containing successions of red beds and evaporites. This specific type of geologic process that led to copper mineralization is restricted to sedimentary rocks that were deposited after free oxygen first appeared in the Earth’s atmosphere approximately 2.3 Ga (billion years ago). Sediment-hosted stratabound copper deposits are typically found with red beds deposited in an arid environment, and evaporite deposits are commonly present in these sequences as well. Evaporite deposits are formed when there is a cyclic evaporation and rehydration of a lake or other water body (sometimes referred to as a playa lake). Water evaporates, leaving behind any salts that were dissolved in the water, and through time the water becomes more and more briny and leads to the formation of salt deposits.

The Central African Belt is a part of the Congo Craton, which has existed as a geologic entity since the late Paleoproterozoic. The age of these formations is estimated to be (based on petrographic and radiometric studies of granitic basement rock) a maximum of 880 Ma (million years old).

The cobalt in question was formed from folding and thrusting of stratigraphic units during the Lufilian Orogeny, which resulted in the thrusting of deformed Archean to Proterozoic basement rocks, overlain by Neoproterozoic volcanic and sedimentary rocks. These orogenic events took place 560-530 Ma, based on U-Pb zircon ages from transpressional deformation in

the inner arc. Late to post tectonic hydrothermal mineralization took place in the outer part of the Lufilian Arc, and continental red beds unconformably overlie rift-related sedimentary sequences.

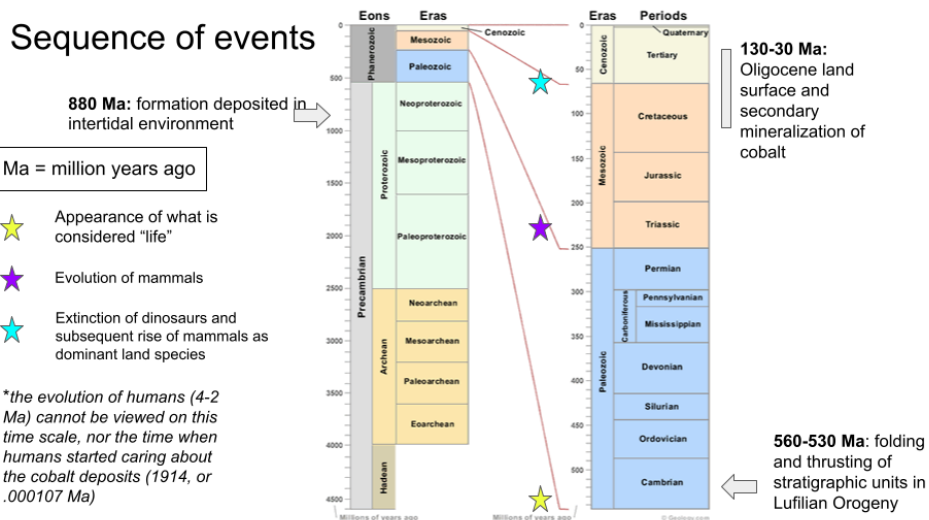


Figure 2: timeline of geologic formation, created in Microsoft PowerPoint.

From 130 to 30 Ma, a low-elevation, low-relief land surface largely mantled by deeply weathered rock developed on the continent, and this Oligocene land surface is called the “African Surface.” It was during this time period that the cobalt deposits developed in this region, which are considered secondary minerals in this case. The cobalt ores in east Katanga formed at about 3 Ma.

Stratigraphically speaking, the deposits in which copper mineralization primarily has occurred is concentrated in the Mines Subgroup in the DRC and the Lower Roan Subgroup in Zambia. Due to the different publications in the DRC and Zambia, some stratigraphic correlations were drawn between different historic nomenclature for geologic units. Given the long tectonic history of the area, the stratigraphic history and differentiation can be fairly complex, and for the purposes of this paper, the Mines Subgroup will be focused.

Specific facies (depositional environment that can include sea level, temperature, marine life, etc) are required for the formation of reduced-copper in sedimentary sequences, and have

typically found to be facies that are at or just above a flooding surface that marks the transgression between a marine or lacustrine depositional sequences and underlying synrift, nonmarine red beds. This essentially means that the depositional facies mark fluctuating sea levels and cyclical flooding and drying of the land surface, and a transition from marine to non-marine environments. The mines subgroup is a carbonate unit that was formed in an intertidal, reef, and lagoonal environment that maintained reducing conditions and is subdivided into three formations- the Kamoto Dolomite, Dolomitic Shales, and Kambove Dolomite. As mentioned before, the changing depositional environments shows fluctuating sea level at or around the flooding surface.

The extent of mineralization in these units vary with stratigraphy, and the richest mineralization is mainly concentrated in two stratigraphic positions, forming two main orebodies. These orebodies are contained in the lower parts of the Kamoto and Dolomitic Shale Formations, referred to as the Lower and Upper Orebody, respectively (El Desouky et al 2010). The lithology of the host rocks consist of dolomitic siltstone, fine-grained dolomite, and silicified stromatolitic dolomite, alternating with chlorite bearing dolomitic siltstone. Dolomite is a type of limestone that contains both magnesium and calcite, and dolomitic siltstone is a sedimentary rock that is composed of silt-sized particles that contain dolomite. The host rocks of the Upper Orebody include dolomitic shale and medium to coarse grained dolomite. The orebodies are separated by a zone that does not contain significant mineralization that contains a reef-type stromatolitic dolomite.

Lateral and vertical zoning of copper-iron sulfides can be observed across the orebodies, as shown in the figure below.

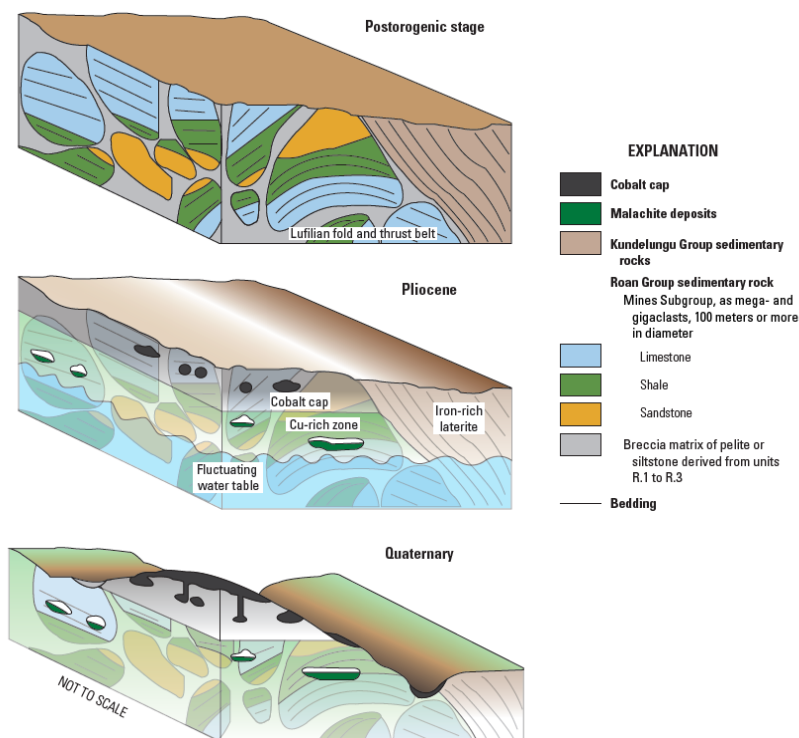


Figure 3: mineralization and formation of ore bodies post diagenesis, from Zientek et al, 2010.

The ore in question occurs as copper sulfide minerals underneath the surface through the host carbonate rock. A 2010 study that used S, C, O, and Sr isotope analyses to differentiate and characterize mineralization events in the ore bodies found evidence for two mineralization events (El Desouky, 2010). The first mineralization mechanism proposed occurred during diagenesis (when the sediments compacted) with fine grained minerals. This model proposes that evaporated seawater migrated through the rock layer, enabling it to reach higher temperatures and interact with basement rocks, enriching the fluid with strontium and Cu-Co metals. The Mines Subgroup provided the most reducing environment for the fluid and the porosity of the unit allowed the fluid to migrate laterally-albeit with some variation. The second mineralization process is classified as a multistage synorogenic stratiform to stratabound mineralization with coarse-grained minerals. This model proposes a deep burial fluid possibly of evaporated marine origin that was able to migrate through the Katanga supergroup via orogenic structures such as

brecciated zones along faults. This high temperature fluid (due to its deep origin) interacted with the sediments, remobilizing Cu and Co. The primary hypogene (occurring beneath the surface) sulfide minerals are chalcopyrite, bornite, carrollite, and chalcocite, and the proportions of these minerals vary across the formation. The supergene (near and on the surface) minerals are also affected by oxidation through weathering processes and these minerals include malachite, heterogenite, chrysocolla, and azurite as the main oxidation products. These supergene minerals are mainly concentrated along cracks in the fracture zones, and also preferentially enrich the minerals in cobalt.

The 2010 USGS report on the Katanga region likewise estimates that there are more undiscovered deposits of copper and cobalt ore in the Katanga region. These numbers were estimated by an expert panel based on what is known about the geologic history of the region and possible fluid migration and mineralization tracts. Their finds were: “within the Carbonate *écaille* tracts (002rfceCu1000a, b, c), with 56 known deposits, a mean of 121 undiscovered deposits is predicted to a depth of 2 km. Within the Ore shale tract, having 9 known deposits, a mean of 1.5 undiscovered deposits is estimated. A mean of 10 undiscovered deposits is predicted in the Roan arenite tract (002ssCu1002), which contains 20 known deposits” (Zientek et al, 2010).

What can be seen from this geologic history and the estimate of the possible unknown deposits is that the natural resources in the Katanga region have developed over a time scale that goes back further than the first appearance of what we would consider advanced life forms on this planet. Furthermore, there are more deposits available that have yet to be tapped into, or have only recently been discovered (as the USGS study at the time of the writing of this paper is about a decade old). Copper and cobalt have been incredibly useful to human civilization in

terms of technological advancement, from the colonial days to lithium ion batteries in electric vehicles. To a certain extent now, it is necessary to extract mineral resources for the functioning of society, and consequently mineral resources have played an important role in geopolitics, whether it be directly or indirectly.

Likewise, the political history of the DRC is inextricably tied to its wealth of mineral resources and is closely linked to its history of violence and instability since its first encounters with European powers in the colonial age.

Part 2: A Brief History of the Katanga Region

The archeological evidence that mining had taken place in the Katanga region during the fourth century most likely was left by a Pygmy tribe. The Pygmy tribes are thought to be the first settlers of the region, entering during the Upper Paleolithic Period. Some Pygmy tribes still remain there today, most centered in the forests of Kibali and Ituri. However, the Pygmies that lived in Katanga were driven out long ago during the Bantu migration in 500 BCE.

The first permanent settlers in the area were the ancestors of the Luba people. The Luba people eventually went on to form the Luba Empire, which controlled much of the region between 1500 and 1800. The Luba empire mined and used their mineral wealth for trade, a network that at the time stretched as far as the Indian Ocean. During this period there was also a large migration of warrior and warrior tribes into neighboring regions, and many different peoples in the surrounding regions of the Democratic Republic of Congo and Zambia trace their lineage to the Luba Empire.

The first contact between the Democratic Republic of Congo and the Europeans came in the late 1400's, when the Portuguese explorers reached the western coast of Africa for the first time. Since Katanga is not located on the coastline, the arrival and influence of the Portuguese was less compared to places such as Sierra Leone. However, the Portuguese introduced the African nations to their firearms, a product that stirred much interest. This initiated the slave trade between the Portuguese and African nations, as African slaves were traded for European fire arms and other goods. The ports along the western coast of Africa was one stop in the infamous triangular trade between Europe, Africa, and the Americas. European goods were traded for African slaves on the "ivory coast," and brought the sugar and tobacco plantations on

the Portuguese and Spanish colonies in the Americas, primarily in the Caribbean islands, Brazil, and Venezuela. The products produced on the plantations were then manufactured in the factories and cities in Europe, and thus the cycle continued.

While the trading occurred on the coastline of Africa, it did pose ramifications for the interior of Africa as well. The introduction of firearms into African geopolitics changed the nature of how empires functioned. In cases of war, the nations that collaborated with Europeans received better weapons and had an advantage. Warfare likewise produced more slaves, which in turn fueled the slave trade. In total, the introduction of Europeans, weapons, and slave trade culminated to destabilize many preexisting African nation states.

In the case of Katanga, the Luba empire remained until the arrival of the Belgians in the 1880's. King Leopold II was interested to explore the Congo based on the accounts and travels of British explorer Henry Morton Stanley, who journeyed down the Congo River between 1874 and 1877. King Leopold established the "Committee for Studies of the Upper Congo" in 1878, hoping to establish trade into Africa's interior via the Congo River, later renamed the Association Internationale du Congo. Between the years of 1879 and 1882, Stanley (under the employment of King Leopold) established stations along the Congo river to open negotiations with local rulers. An interpretation of these events is offered by Joseph Conrad in his renowned book *Heart of Darkness*, in which Henry Morton Stanley is the main character and principal perspective. Joseph Conrad himself operated a steamboat through the Congo in 1890 and published the book to protest the conditions suffered by the natives in the Congo in 1899. By 1884, the Association Internationale du Congo had established peace deals with over 450 independent African entities. Based on these "peace talks", King Leopold decided that it was his right to rule the whole of the land as an independent state in 1884.

Shortly following this action by King Leopold II, other European entities were interested in Africa for their own colonial enterprises, as the natural wealth of Africa was being discovered. Thus the Berlin West Africa Conference was held in 1885, also known as the “Scramble for Africa.” It was during this conference that the European nations established the rules for colonization and declared the Congo river basin area to be known as the Congo Free State, which lasted from 1885-1908, and recognized King Leopold II as sovereign. The European powers at the conference did not recognize the land claims or heritage by the indigenous African peoples or African nation states, and the ways in which the territories were divided was completely subjective and not related to preexisting territories and ethnic divides. This disconnect between cultural history and colonial political boundaries created further tension between the peoples of Africa and contributed to long lasting instability across the region (“Berlin West Africa Conference” 2020).

During the 1890’s, King Leopold II committed many atrocities in the Congo Free State in the name of his “civilizing mission.” and in the effort to quickly construct a railroad, without which the Congo would not be profitable. He needed large amounts of forced labor to construct a railroad, and “transform his nascent administrative system into a machine designed to extract not only the maximum amount of natural resources from the land but also the maximum output of labour from the people. In order to secure the labour necessary to accomplish Leopold’s goals, his agents employed such methods as kidnapping the families of Congolese men, who were forced to meet often unrealistic work quotas to secure their families’ release” (Wiese et al 2020). The Force Publique, Leopold’s private army of African soldiers led by European officers, also worked to suppress any rebels and resisters and were known to slaughter and burn the villages of rebels and chop hands off. The writings from the likes of Twain and Conrad, as well as accounts

and pictures from missionaries, spurred international criticism for the treatment of the Congolese people. In 1908, the parliament of Belgium moved to annex the Congo Free State from King Leopold II and place it under the rule of the state. However, life under Leopold's rule in the Congo Free State left a long lasting and destructive impact, including deep anti-Western sentiment, which kindled the flame for future nationalist movements.

King Leopold took possession of the Katanga region in 1891 and on behalf of the Congo Free State, the administration was put under one of Leopold's companies, named Compagnie du Katanga. There was a major rebellion in 1885 protesting forced labor in the copper mines, and the first effective administration was put in place in 1900, a separate entity from the Congo Free State. When power was turned over the Belgian state, the area was integrated in the Belgian Congo, and remained fairly autonomous until 1933. In 1933, it was renamed the province of Elisabethville, after its capital, now called Lubumbashi. After 1933, the mineral resources in Katanga were heavily exploited by Belgian firms, and as a result of the mining, Katanga was better developed compared to other provinces in the Belgian Congo.

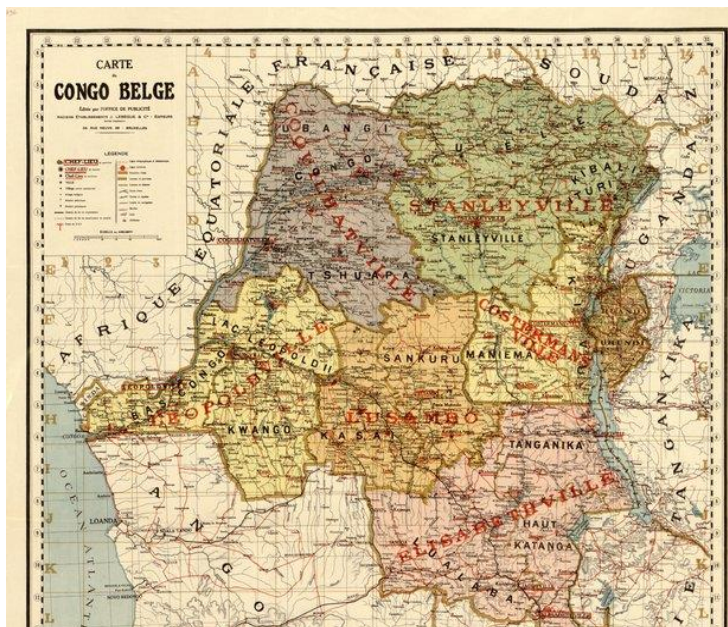


Figure 4: Map of Belgian Congo from World Digital Library

Anti-Western sentiment, warfare, and poor treatment under the Belgian state that wished to retain complete political control brewed nationalist rebel movements across the Congo that came into being during the 1950's. In 1957, the Belgian government did pass significant government reform that would allow the Congolese to live under a semblance of democracy. But a movement for the independence of the Congo from colonial rule was already under way. Under Joseph Kasavubu, the group Alliance des Bakongo (ABAKO), an association based in Léopoldville (now Kinshasa) spread nationalist movements and sentiments across the country, leading to the formation of the political party, the Congolese National Movement (CNM). The cofounder of the CNM was Patrice Lumumba, a powerful orator and advocator of Pan Africanism. After anti-European riots in the capital led to the death of many Congolese by colonial security forces, the Belgian government granted the Congo independence. After a round table discussion in Brussels to decide how best to navigate a peaceful transition of power in January 1960, the Congo was officially granted independence in June 1960.

At the time of independence, the Katanga region seceded from the leadership under Kasavubu, and instead were united under the leadership of Moise Tshombe, from a local political party. Their independence was supported by the Belgian state and troops for what is assumed to be economic interests. Meanwhile, the central Congolese state was being fought for between two factions, one headed by Kasavubu, the president, and Lumumba, the prime minister.

Lumumba appealed to the U.N. and later to the Soviet Union to bring Katanga back under central Congolese control, effectively implicating the Congo in the East-West animosities of the Cold War.

The Katanga secession set in motion the process of fragmentation that left the country in four parts (Katanga, Kasai, orientale province, and Leopoldville) by September of 1960. Seizing

this opportunity of fragmentation, army chief of staff Joseph Mobutu (later called Mobutu Sese Seko) took power in a coup d'etat and the army that would rule under a caretaker government. Subsequently, Lumumba was captured and executed at the hands of the Tshombe government. Efforts were made to reintegrate Katanga back with the rest of the Congo, and a violent interaction between the European-trained Katangese gendarmerie and UN Forces ensured that the secession was crushed. There was more instability and fighting in the subsequent years as well, as fighting between factions loyal to Tshombe and other factions loyal to Lumumba struggled to claim power.

Mobutu seized the presidency of an increasingly fragmented nation in 1965 and removed Tshombe and Kasavubu from the government. Tshombe fled the country and lived in exile in Spain.

While Mobutu retained control of the central government, there were still those in the Katangan district that maintained loyalty to the ousted prime minister Tshombe, of which there were rumors of his return. In 1966 a mutiny in Kisangi was crushed, and a second mutiny exactly one year later broke out after hearing that Tshombe's plane had been hijacked in Algiers, where he was held prisoner and later died of a heart attack. The mutiny was led by a Belgian settler and included 100 former Katanga gendarmes and 1000 Kanganese. They held their ground against the Congolese National Army until November 1967, when the mercenaries fled to Rwanda and surrendered.



Figure 5: Mobutu Sese Soko, from Newslibre

Meanwhile Mobutu’s administration tried and failed in attempts to improve the economy. In 1971, Mobutu renamed the country Zaire as a part of an “authenticity” campaign, which tried to enforce a cultural identity for the country and to make it more “politically organized”— Mobutu’s MPR party was the only political party in the country from 1970 to 1990. In actuality, Mobutu’s reign was based on “bonds of personal loyalty between himself and his entourage” (Weise et al, 2020). Katanga was renamed Shaba when the country was called Zaire.

An opposition party did develop, and in 1977 the Congolese National Liberation Front (FLNC) launched two major invasions into Shaba (Katanga). The friendly governments of France and Morocco intervened and were successful in preventing invasion, but at the cost of many African and European casualties. While the invasions were unsuccessful, their near success showed the growing sentiment from the poorer classes against Mobutu at the time.

After the end of the Cold War in 1990, many western countries began openly supporting and pushing for democratic reforms in Zaire, and Mobutu did lift the ban on opposition parties in the same year. However, he followed this act with the brutal suppression of student demonstrators at the University of Lubumbashi in May 1990, resulting in the deaths of 50-150 students. The international reaction to this was extensive, as France reduced its monetary aid, the US publicly condemned Mobutu in Congress, and the World Bank cut ties with Mobutu following his appropriation of \$400 million from Gécamines, the state mining company.

In 1991, Mobutu convened a national conference, called the High Council of the Republic, to oversee a transition to a multi-party democracy. The council selected Etienne Tschisekedi as the prime minister, a dissident from the Kasai-Oriental province who had charged the army with the massacre of 300 people in the diamond mines in the early 80's.

Mobutu resisted this change of power by pitting different groups against each other and allowing his army to plunder regions of the country and sectors of the economy to keep it under his control and gain. In 1994, Mobutu reached an agreement with the opposition and passed the Transitional Constitutional Act, but real reforms and elections never took place.

Zaire borders Rwanda on its eastern side, and the Rwandan genocide broke out in 1993, in which the ethnic Hutus efficiently murdered 800,000 of the ethnic Tutsi minority. This was followed by a 1993 invasion of Rwanda by a militia group composed of Tutsi exiles named Rwandan Patriotic Front (FPR). Mobutu offered support to France and Belgian troops that were backing the Hutu-led Rwandan government, which renewed relations between Mobutu, Belgium, and France. Furthermore, business ventures concerning the natural resources in the country likewise opened diplomatic channels.

However, Mobutu's political opponent Joseph Kabila gained support from local ethnic Tutsis and the Rwandan government and formed the Alliance of Democratic Forces for the Liberation of Congo-Zaire, which also gained the backing from the governments of Uganda and Angola, as Mobutu had supported rebel movements in those countries previously. In 1996, Kabila and his supporters launched an offensive from the east and took over Bukavu and Goma on the shores of Lake Kivu, northeastern province that now is the site of coltan and tin mining. In 1997, Kisangani also fell, followed by Lubumbashi. After negotiations between Mobutu and Kabila failed and rebel forces took the capital, Mobutu fled and died shortly thereafter.

Kabila took the presidency and restored the name of the Democratic Republic of Congo in 1998, and outwardly appeared to be moving toward democratic reform, attracting some foreign aid. However, the reality became apparent as Kabila banned political parties and public demonstrations and was accused of human rights abuses.

In 1998, rebellion in the eastern provinces started a long and bloody civil war that involved many different actors and militia groups that controlled different regions and interests. Bordering countries were also involved in this conflict and supported the different militia groups that resided in the different regions of the Congo. The 1999 Lusaka Peace Accord stationed UN Peacekeeping Forces in the area to help protect the civilians from the violence of war. The conflict was driven by the intersection of deep ethnic tension, not just between Hutus and Tutsis, political alliance, and the fight for resources and survival in a country so mired by conflict. In the end, it has been estimated that around 300 million people were killed during this 5-year civil war, making it the bloodiest event in history since World War II (Wiese et al 2020).

In 2001, Kabila was executed and his son took power, but struggled to rule and unite a country so deeply divided, ridden with conflict, and with a decimated economy. The government struggled to exercise any real control, and regional militias exercised more direct control of the civilians. The civil war was brought to an end in 2003, when a transitional government was put in place, however conflict continued in many parts of the country (Eichstadt, 2011). Meanwhile, as a result of the conflict, many Congolese who had been living in the eastern provinces had to flee their homes, creating a large population of war refugees that had limited means to feed and support themselves. Many refugees, having little other options, were recruited by militia groups as a means for survival. The presence of these militia and rebel activity, in particular the rise of rebel Laurent Nkunda, made economic progress and peace difficult.

Throughout the 2000's, Kabila's government continued to struggle to authorize actual control over the country, particularly in regions far away from the capital (Eichstadt, 2011). The fight for fair elections has been ongoing, while obstacles such as rebel groups, violence, fighting political parties, and mysterious fires destroying voting machines have stood in the way and have made free elections seem nearly impossible for the country.

In 2019, however, Tshisekedi was sworn in as president (after a highly contested election), marking the first peaceful transition of power in the country since it first gained independence in 1960.

Part 3: Development of Cobalt Mining Sector

The mining industry in the DRC has long been important and intertwined with its politics. The mineral riches, as well as ivory, of the DRC were what first attracted the European nation states in the late 1800's, and railroads were quickly constructed in the early 1900's to export large amounts of copper from the Katanga region. In 1914, cobalt was first discovered in the Katanga region and became one of the most important suppliers of cobalt, as cobalt was growing increasingly important in the global economy and was first mined in Sweden in the 1840's. In that time, the largest use of cobalt was in the coloring of ceramics and glass- where the term cobalt blue comes from. However, cobalt is linked with the copper mining industry, as it is produced from the smelting process of copper, an even more valuable mineral at the time. For this reason, the Katanga region became one of the most profitable and developed regions in the country, with the city and capital of the region Lubumbashi becoming increasingly important in the country.



Figure 6: ceramics and glass colored with cobalt. Source: The Cobalt Institute.

The first mining company formed in the DRC was Gécamines, which was established in 1906 after a merger of Société Générale de Belgique—Union Minière du Haut Katanga (UMHK) and Tanganyika Concessions Ltd. UMHK was established as the state mining company in the Katanga region after the Belgian state took control of the Congo. In 1967, following

independence and subsequent political instability, UMHK became Congolese General Minerals (GECOMIN). In 1970 GECOMIN became Congolese General Mines (GÉCOMINES) which in 1972 became Gécamines. Three subsidiaries were created in 1984 and subsequently merged in 1995: Operating Gécamines, Gécamines-Commercial, and Gécamines-Development. During the 1980's Gécamines was the world's largest mining company- producing nearly 500,000 metric tons per year.

Throughout this time, cobalt increased in value and economical importance as cobalt alloys were used across various industries, and in magnets. During the 1970's, the dependence on the African Copper Belt became apparent when conflicts impacted cobalt exports and the price for cobalt rose on an international level. After this event, European states and the US diversified and invested much more in cobalt recycling operations and the use of nickel instead. However, the Congo still remains the largest global producer of cobalt to this day.

The newest use for cobalt is in the construction of lithium ion batteries because of its great energy density. Cobalt has the ability to pack power into small spaces without heating up. It is this property that enables the steady generation of high levels of electricity needed to power cell phones and laptops while keeping them small, and on larger scales the electrical power needed to sustain motion in an electric vehicle over longer distances. The technological implications of the application of cobalt are exciting, especially as there is increased pressure to transition to electric vehicles to reduce carbon emissions. However, this development in technology has come with its own price on the wellbeing of the Congo.

While the price of its mineral commodities have been increasing and have become more important on the global stage, the Democratic Republic of the Congo has seen only limited benefits from its valuable mining industry. During the colonial area, the colonial states were used

as wealth generators and suppliers of natural resources for the benefit of the colonizer. While the Katanga region did see more development and prosperity compared to the other regions of the Congo, this did not necessarily benefit the Congolese. In a 1940 report of the mining ventures of then UMHK, the mining sector was already pretty developed, using current machine mining methods (and inconceivable amounts of coal for modern standards, but let's focus on the treatment of the Congolese for now). Refining centers had already been built in Lubumbashi and Panda, and more plans for development were under way (Birchard 1940).

While the mining company did employ natives, the treatment of native workers versus the European workers was starkly different. In 1937, there were 7500 Europeans living in the Congo, and many were incentivized to move there because of the mining contracts with UMHK. The company offered three year contracts, with travel to and from the Congo fully paid for by the company. The Europeans (mainly from Belgium) received free housing, water, electricity for lighting, and medical attention. They received \$5.20 a day with monthly bonuses up to \$15, along with a cash allowance of \$11 for a wife, and \$8 per child. The native Congolese workers, primarily of Bantu origin, by contrast received food, clothing, shelter, and medical attention, and were paid \$0.85 a day (Birchard 1940). The report also said that the profit margin for the company was high enough to survive the Great Depression, and as this was the mining company for the Belgian state, these profits would have only been used in the Congo according to how the Belgian state saw fit.

After the Congo was first granted its independence in 1960, the mining sector was seen as a way to generate revenue and promote development of the state through the establishment of state mining companies with high equity stakes. However, the dictatorship of Mobutu proved disastrous for the economy of the Congo, as a period of "financial plunder" under the

administration of Mobutu ensued. This was due to significant corruption and mismanagement of funds, as Mobutu had a tendency to use the revenue of state companies for his own gain and those who remained close to him. The 1980's saw the near collapse of the state mining company as the role of private investors and investment diminished, operations deteriorated, and prices dropped. This likewise was a result of mismanagement under the dictatorship of Mobutu. The Mobutu dictatorship proved to be financially disastrous for the mining sector, as studies from the World Bank and other organizations documented extra-legal diversions between USD 150 million and USD 400 million per year from DRC's cobalt revenues under the leadership of Mobutu, amounting up to 30% of annual exports. Mobutu's deliberate political appointments of management personnel translated into mismanagement that generated and sustained widespread corruption, high transaction costs, and low productivity (Garret & Lintzer 2010).

The connection between government structure and economics of the state is described in a socioeconomic theory called the Rentier State. A rentier state means that if the state is more dependent on the extraction of its resources than the taxation of its citizens, the well-being of the citizens is not dependent on the wealth of the state or government. This type of structure lends itself to authoritarian rule and dictatorships (Zeuner 2018).

This structure is often predicated by a colonial history, in which the state was designed primarily for the large exportation of natural resources that monetarily benefited (to the largest extent) the colonizer, usually a European or other western power. Following independence movements, the government's revenue was generated primarily from exports, probably due to a lack of development in the country and national economy. If the government was corrupt in collecting the revenue from its exports, the profits would not benefit the communities that

actually generated the wealth, but rather the pockets of the dictator and those loyal to him. This is seen in the Mobutu dictatorship from 1965-1998.

The result after a history of colonialism followed by a dictatorship is a weak state whose wealth is inherently intertwined with the global market, which is susceptible to fluxes in supply and demand, and whose profits are not benefitting the Congolese state as a whole.

Part 4: Shared colonial roots: A comparison with Chile

The first critic of the long lasting effects of colonialism was explorer, naturalist, former mining inspector and geologist Alexander von Humboldt, who was paid by the Spanish crown to study the natural life of South America from 1799-1804. He spent years traveling around South America, starting in Venezuela, climbing the tall volcanoes in Peru and Ecuador, observing and cataloguing species in the rain forests of Central America, and finally finishing his American tour with a visit to Thomas Jefferson before returning to Europe. Throughout his travels, he took fastidious and detailed notes of everything he saw. He published several volumes of his work and findings when he returned to Europe, and changed the way that scientists viewed and understood nature. He was the first naturalist to see nature as a coherent and connected ecosystem, rather than as separate categories and clades—the taxonomic perspective that was the dominant view at the time. His numerous travel volumes included engravings and thorough anatomical descriptions of thousands of new varieties of plants and animals and later inspired Charles Darwin to embark on the *Beagle*.

However, he also published a volume called the *Political Essay on the Kingdom of New Spain*, in which he harshly condemned the colonial practices of the Spanish crown in the colonies, especially slavery. He was actually the first to ever link colonial practices with the degradation of the environment, and the first scientist to predict human induced climate change at all. He later proved to be tremendously influential on the young Simon Bolivar when the two crossed paths in Rome. It was in Rome that the young Bolivar first started dreaming of a better future for South America, founded upon democratic principles. A couple decades later, Bolivar would spark revolutionary movements across Latin America and establish the state of Colombia.

His volumes “made several points very clear: colonialism was disastrous for people and the environment; colonial society was based on inequality; the indigenous people were neither barbaric nor savages, and the colonists were as capable of scientific discoveries, art and craftsmanship as the Europeans; and the future of South America was based on subsistence farming and not on monoculture or mining” (Wulf 2015 pp 180). He strongly condemned the use of monocultures, reliance on exports, and the use of *repartimientos* and other labor systems that very closely resembled slavery. He lamented at the destruction of the soil in areas that were formerly used for agriculture but had been taken over by large scale monoculture and cash crops like sugarcane and indigo. He said that the source of revenue should not be on these monocultures and mining industries, but rather on local agriculture that could feed the people and lead to long term health of the soil. The destruction of local agriculture and replacement of land that used to be used for food production led to a dependence on imported food and goods for colonial states. This put them in an ever increasing cycle of debt and dependency on their European rulers. Humboldt also criticized the crown for the creation of a system based on inequality and would later warn Bolivar that any fight for independence or revolution would be accompanied by ethnic violence. The revolutionary wars in Latin America decades later would unfortunately prove him right.

His critiques of the colonial system hold true in the case of Africa, although differences in time periods, society, and natural resources resulted in slightly different manifestations of colonialism. In a similar manner, Africa was divided into colonial states under European control. In the case of South America, the European ruler was the Spanish Crown, and South America was divided under viceroalties that had their own viceroy as leader, yet still under the rule of the Spanish crown. Society under Spanish rule was harshly divided based upon ethnicity, leading

to social stratifications that were closely bound to one's ethnicity and background. At the bottom of these social classes were the indigenous peoples and imported African slaves, who worked on plantations, in the mines, or in a forced labor system like the *repartimiento*. At the top of the social classes were the *peninsulares*, people directly from Spain. Just below were the wealthy creoles, the children of the *peninsulares*. The Spanish first established these states after it conquered the land of South America from the indigenous empires that inhabited the land before they arrived. It is estimated that 60% of the indigenous population died shortly after the arrival of the Europeans, most from European diseases, and others at the hand of the *conquistadores*. These nation states were established for the most part in the 1500's and the Spanish empire continued to grow. The success of the American Revolution in 1781 and the first successful slave revolution in Haiti in 1804 sparked a series of movements across South America known as the Spanish American independence movement during the early nineteenth century.

This colonial history had similar ramifications in the mining industry as the Congo, specifically in the case of the copper industry in Chile. The mining industry in Chile was first started for the exportation of gold and later silver. This is a common theme with colonialism too—the structure is the same, while the resource in question changes based on time period and geographic location. Chile was originally deemed profitable because of the national interest in the acquisition of gold, as most currencies were based in actual gold. Hence the urgency of finding gold, a theme seen in the movie depictions of the New World during the colonial era, such as *Pocahontas* and the *Road to El Dorado*. Later, silver became the metal of choice, and subsequently caused an economic crisis for Spain as the influx of silver from the mines led to inflation. The mines in the Chilean Andes were a source of this gold and silver, and was valuable

because of its mineral riches. The laborers in the mines were originally indigenous men, employed through a labor system that operated like slavery in all but name.



Figure 7: Depiction of mining in South America during the colonial era. Source: Epic History.

Copper mining started in the Chilean mine in the end of the 17th century, and the copper mined in Chile was sent to Peru for the manufacturing of cannons. By the end of the 18th century, conditions for the workers improved slightly and the formation of labor unions were permitted. These labor unions were supported by the colonial government through the denomination Real Tribunal de Minería. Following the independence movements in Chile and the Constitution of 1833 made by Diego Portales, the mining industry that had already existed in the colonial era was used as the primary inflow of revenue and was used to pay for growing demand for imports as the wealth of the merchant class grew in Chile. This effectively continued the divide between the labor classes and upper classes that were developed in the colonial state (“Minería colonial (1541-1810)” 2018).

The mining of copper became particularly important in the Chilean economy during the 19th century, as improvements in technology for the extraction and smelting process made the material much more profitable and useful. A fall in international prices dealt a blow to the copper industry in Chile during the middle of the century, and when international prices rose again many North American companies took the opportunity to move their operations into Chile.

Copper remained one of the principal exports from the Chilean state, constituting about 75% of Chilean exports before 1970. An increase in demand in the early twentieth century incited global copper companies to mine in Chile to meet this increased demand. However, the valuable mineral only made up a part of the ore that was actually mined, and technological improvements in the copper smelting process were only just beginning, not to mention that these processes were disastrous for the environment. However, by 1929, Chile produced 40% of the world's copper.

In the same time period, the colonial mining company owned by the state of Belgium had just established the railroad to the Katanga region of the Belgian Congo, and had begun exporting copper from the mines in 1910. In contrast to Chile, the Congo would not get its independence for another fifty years, while Chile had been granted its independence nearly a century before.

In Chile, engineers and geologists employed by North American mining companies mapped and surveyed the area and began extracting copper. The three largest companies were the Braden Copper Company, the Chile Exploration Company and Andes Copper Mining, all established before 1916, and were referred to as the Gran Minería del Cobre because they controlled so much of the Chilean copper exports (“Origen de la gran minería del cobre (1904-1930)” 2018). As Chile remained the world's largest producer of copper through the twentieth century, yet the profits and control of the mining process went completely to the North American companies and not the Chilean state, protest movements across the country raged, including labor unions like the Sociedad Nacional de Minería and socialistic political sectors. These resulted in the nationalization of the Gran Minería del Cobre and the establishment of the state mining company CODELCO in 1971. The nationalization of the copper industry followed a growing

socialist movement in Chile at the time, and the election of Salvador Allende. Allende stressed that in order to truly tackle the nation's social problems there is a need for radical structural measures such as agrarian reform and the nationalization of foreign-owned firms so that profits from the sale of the nation's natural resources could be spent on social welfare. The Chilean government saw some changes through the 1940's when it banned the Communist Party under pressure from the United States, and Allende was a figurehead of the socialist faction of politics, earning the presidential nomination three times. Finally, in 1970, Allende won the presidency, and with his Popular Unity government, he was able to start ambitious social and economic programs (US Office of the Historian).

Using the existing constitutional system, the goal of Allende's government was to nationalize much of the industry in Chile, implement a massive program of income distribution, end the dominance of the large farms, and develop popular participation in the running of the economy and the political and legal system. Under Allende's Popular Unity government, Chile moved quickly to free itself from a situation in which the U.S. owned and controlled 60% of the economy and held the other 40% in dependency. U.S.-owned copper mines, other foreign-owned companies and banks were nationalized. Large landholdings were seized and given to the peasants. Political prisoners were freed. Production began to increase rapidly; wages went up 60% and most prices were frozen. Allende had a populist economic strategy: freezing prices and raising wages.

The economic policies that entailed the nationalization of the copper industry served to protect the interests of Chile by ensuring that the profits went back to the Chilean state, instead of the US companies that operated there. As this harmed the economic interests of the US, relations between the two countries soured after the election of Allende. In the immediate years

after Allende's election, the CIA was involved in a destabilization campaign against the Allende administration by funding other candidates and movements against Allende. As his other economic policies started to prove unsuccessful because of a drop in copper prices and a rise in inflation, more protest movements and strikes struck out against the country. A successful coup led by General Pinochet and supported by the US in 1973 saw the rise of Pinochet as the president of Chile (US Office of the Historian). This proved to be better for US economic interests, although Pinochet quickly dismantled Congress and outlawed many leftist political parties in Chile. This ended democratic rule in Chile, and the dictatorship of Pinochet has been internationally criticized for human rights abuses and lasted until 1990. These US foreign policies that saw the support of dictatorships to protect economic interests and suppress left wing political parties for fear of Communism were repeated in other Latin American countries during the Cold War era.

On paper, at least, CODELCO remained nationalized and on a long term time scale served to benefit the Chilean state and economy, especially after democratic rule was reestablished. After the nationalization of the copper industry, copper began to make up less of the total exports of the country, falling from 75% of exports in the 1960's to 40% of exports, the level today (Meller 2003). This means that Chile is now less reliant on the export of copper for its total income, even while it remains the largest producer of copper in the world. One way to measure the overall wellbeing of a country beyond merely its exports and imports in the human development index. This was developed by the UN in 1990 and takes various factors to measure the human potential in a country in three dimensions: health, access to education, and standard of living. The UN creates country profiles for member states and publishes updated reports every

year. The limiting factor of these reports is that they only go back to 1990, however it is still useful for looking at recent trends and improvement.

Chile has an index of 0.851, ranking in 43rd on a global scale. The country has seen constant improvement in its HDI index, as it was 0.7 when it was first published in 1990. By comparison, the DRC has an index of 0.48, ranking it 175 on a global scale.

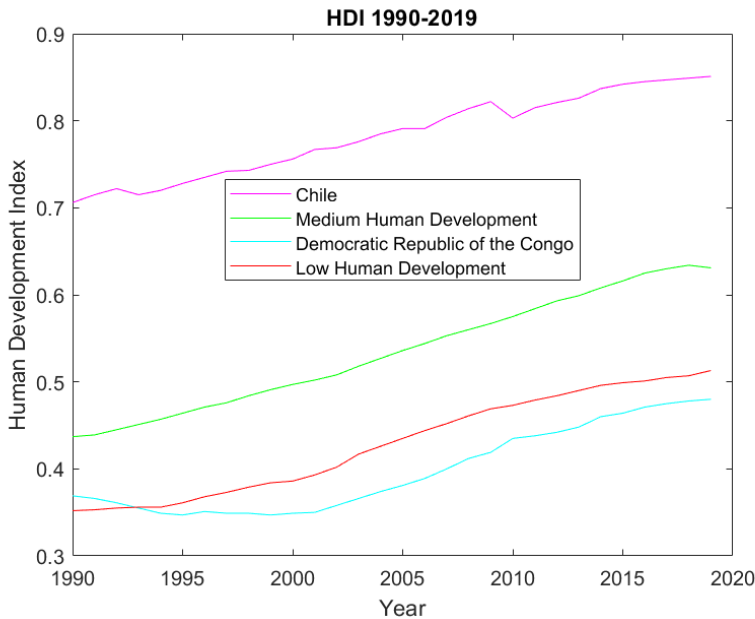


Figure 8: HDI plotted using data from UN on MATLAB.

When looking at the individual components of the HDI, Chile and the DRC share some similar values, and both countries have extremely profitable mineral resources. However, the two are starkly different in the categories of development and access to education, and the gross national income of the Congo is extremely low, despite the business ventures that are in the Congo that have been yielding great profits.

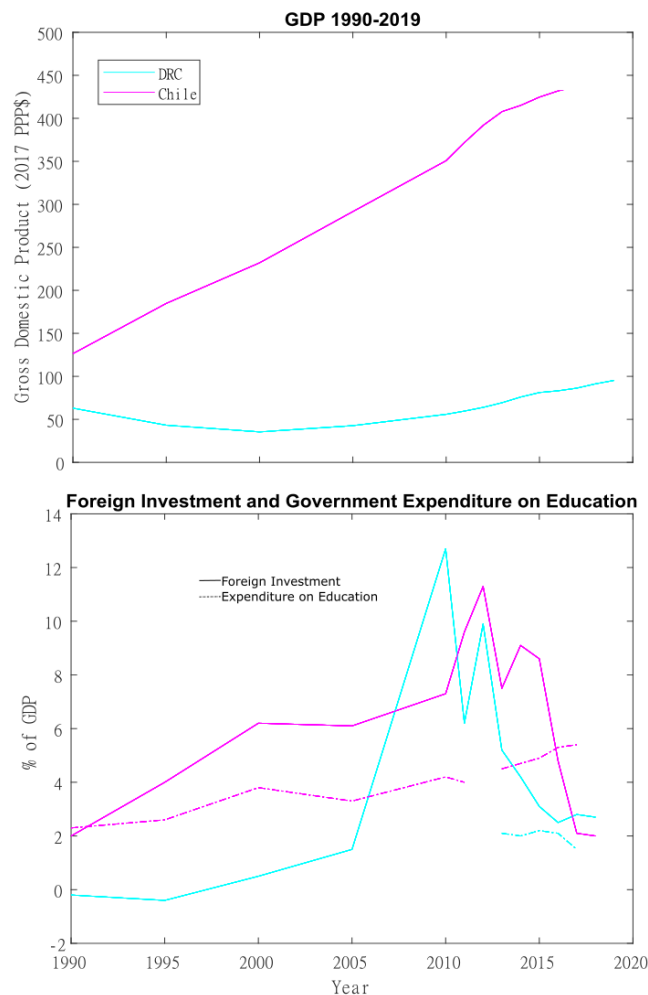


Figure 9: GDP of DRC compared to Chile (top), Foreign Investment and Government Expenditure (both expressed as % of GDP) compared between DRC and Chile (bottom). Data from UN.

It can be argued that the low gross national income can be attributed to the fact that the profits from the cobalt trade do not go back to the Congolese government. Although state mining companies were established in the Congo following their independence in 1965, the dictatorship of Mobutu saw that the profits of the copper and cobalt industry did not support development of the country. This trend with both the

Congo and Chile having established dictatorships that profited off the exportation of resources is in agreement with the Rentier State Theory discussed earlier. In the case of Chile, the development of the country led to an eventual decrease in dependence on the export of copper, as percent of copper compared to total exports decreased since the nationalization of the copper industry, and percent of sum of imports and exports to total GDP has decreased as well. In terms of the Rentier State Theory, this would mean that the government was more dependent on the taxation of its citizens for its wealth, as Chile is now a functioning democracy, and therefore would be more responsive to the needs of the population.

As can be seen in Figure 9, for both the DRC and Chile foreign investment did not have large impacts on increasing GDP, and the DRC has significantly lower GDP and government expenditure on education, while having similar foreign investment values (and even greater in the case of 2008).

Based on this, it would seem that reforming business structures in the state mining companies like Gécamines in a similar manner as Chile such that the profits from the companies are used to benefit the state and promote development in the long term would be a useful strategy in the case of the Congo. Especially since the first peaceful transition of power since its independence just occurred in 2019 with the election of Tshisekedi, it seems as though there is an opportunity for a turnaround in the Congo using the cobalt industry. However, the cobalt industry in the DRC poses another level of complexity following new mining codes in 2002 that incentivized private investment—inviting in billionaires, hedge funds, and corruption.

Part 5: Introducing Dan Gertler and Hedge Funds: A look at international business and economic policies and their ramifications in the DRC

Toward the end of the African Civil War, privatization of the mining industry was seen as an avenue to promote development of the state and contribute to long lasting health of the economy. This movement for privatization was supported by the World Bank and other western powers (Garrett and Lintzer 2010), as opposed to the nationalization strategy taken by Chile.

In the case of the Congo, the incentive to privatize allowed large corporations to move into the cobalt industry, especially when the state was weakened during the civil war. Enter Dan Gertler, the billionaire who has been under US sanctions since 2017 because of his dealings with the Congo.

The history of the Congo and Dan Gertler begins in the midst of the civil war. Gertler was already wealthy, coming from a family who controlled much of the diamond trade- what originally brought him to the Congo. Gertler arrived in the Congo in 1997, and was a friend of then president Joseph Kabila. After the assassination of Kabila in 2000, his son already had a relationship and trust with Gertler, an established businessman with assets. Gertler promised millions of dollars in support to Kabila, and access to arms, according to a UN report. In return, he was granted a monopoly on the cobalt industry. Gertler was also able to get the backing of then US president George W. Bush in 2001 at the request of Kabila.

Gertler used his connection with president Kabila to aid in mining deals, attain mining contracts, and he helped other corporations move in. Most notably, he helped Glencore and Och-Ziff (a New York based hedge fund) invest in large mining projects in the Katanga region, from which he himself made large profits. He used his political influence to facilitate acquisition of new areas and settle disputes between the government who gave out the mining contracts and the

businesses looking to move in. Och-Ziff was later charged with corruption offenses and accepted that Gertler had paid at least \$100 million in bribes. Gertler essentially was the gatekeeper for the cobalt reserves in the DRC, or half of the world's reserves of the valuable mineral.

Meanwhile, the civil war in the Congo proved to be the bloodiest war since WWII, and the violence and instability afterward led to the deaths of hundreds of thousands more, a rape epidemic, and millions displaced. However, for some businessmen, it was an opportunity to profit off a weakened state for their own gain.

The three primary businesses that I will focus on in this paper are Glencore, Katanga Mining Ltd, Gécamines, the Kamoto Copper Company.

Glencore was founded in 1974 by Marc Rich, a businessman who made millions circumventing the Arab oil embargo and sold oil for huge profits to US companies. He primarily traded in metal and oil, investing a 27% stake in US aluminum in 1987 and a 66% stake in Peruvian lead and zinc in 1988 through the method of debt financing. Following a loss of \$172 million after a failed attempt to dominate the market for zinc, management bought out the company from Marc Rich and renamed the company Glencore.

Glencore is the parent company of Katanga Mining Ltd with a 75% stake, and first made contact with the DRC in 1997 following being incorporated in 1996. It formed a joint venture with Kinross Forest Ltd in 2001. Just a year after this joint venture was formed, the World Bank sponsored mining codes, passed by Joseph Kabila in 2002, that created a more favorable climate for private sector investment. Subsequently, Gécamines joint ventures all of its assets, and its operating assets were antiquated, resulting in production costs that were not competitive.

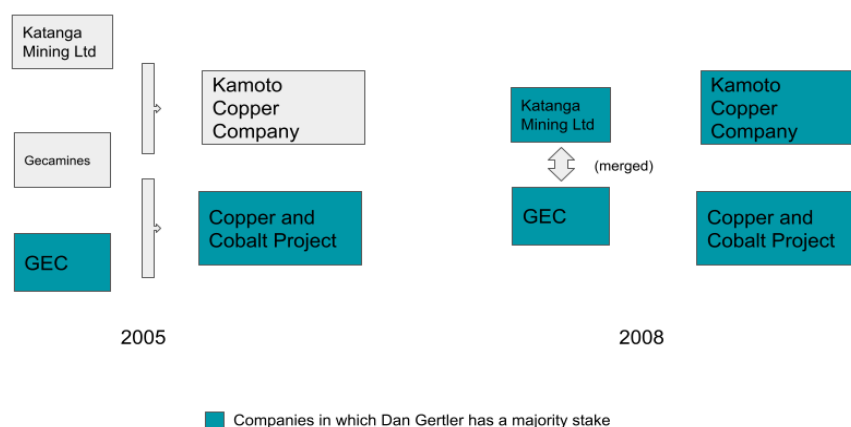
A paper that analyzed the mining sector in Katanga reads, “contextualizing these production costs with its financial losses, it is evident that Gécamines only survives due to

royalties paid by its different joint venture partners” (Garrett & Lintzer, 2010). These royalty payments are enabled by an extra legal relationship between Gécamines and the state, as the company could hold exploration licenses without actually exploring or paying fees, and could convert these exploration licenses to exploitation licenses without having development plans. Essentially, the company could control prospective ground and then joint venture to the private sector to get new bonus payment, which then went back to investors, keeping the mining company artificially alive.

I am going to focus on the joint ventures formed between Gécamines and companies that were directly controlled by Gertler. In 2004, two joint venture agreements were formed. One between KFL (Katanga Mining) and Gécamines, making the Kamoto Copper Company (KCC), and the other between GEC (later renamed Nikanor) and Gécamines, forming the DRC Copper and Cobalt Project (DCP). Nikanor is owned by Dan Gertler. This information is public and could be found on the websites of the companies.

Figure 10: Overview of joint ventures and mergers following the new mining code. Created in PowerPoint.

Joint Ventures 2002-2010



One year later, in 2005, KCC and DCP joint ventures received approval from the Council of Ministers and Presidential Decree, although Joseph Kabila was not established as president until 2006 following the end of the civil war. From 2005-2007, USD 2.1 million in capital was raised for mining projects in the DRC. In 2008, Katanga and Nikanor merged, effectively cementing Gertler's wide reaching control of the industry. During 2006-2008, the mining cadastre had processed more than 9220 applications and had delivered more than 5359 mining permits, and nearly 70% of exploitation licenses went to Gécamines and SIDICO, a subsidiary of Gécamines created under Mobutu. There was a bit of a boom and bust, related to a drop in prices and the 2008 financial crisis, and this primarily affected the artisanal mining sector (Garrett & Lintzer 2010). However, there was an industry recovery in 2010.

In 2011, the same year that cobalt was declared "critical" by the EU and strategically important in the US, Glencore went public in the stock exchange, valued at USD 60 billion. Currently the company has 190,000 employees in 50 different countries and more ships than the British navy (Moshinsky, 2015).

It was this privatization that fueled and facilitated the establishment of these large transnational organizations, and ensured that the profits generated from the mineral wealth of the DRC did not go back to the people of the Congo. Likewise, the weakness of the state and personal connections allowed Gertler and his associated companies to purchase mining rights well below market price and sell them, making fortunes from the royalties. The royalties generated from mining endeavors for state mining companies generate much revenue that generally goes back to the state, but not in this case.

As cobalt prices continued to climb, Glencore and Gertler's companies continued to make huge profits while the state of the DRC continued to struggle. In the past few years

however, Gertler and Glencore started to face legal challenges because of corruption charges. Dan Gertler and 34 entities associated with him were put under US sanctions in 2017, meaning that any company in which he held a majority stake could not do business with US companies and any assets under US jurisdiction would be frozen. This came after accusations of corruption and links to human rights abuses and violence in the country and the passing of the US Global Magnitsky Human Rights Accountability Act. It was reported that the DRC lost over USD 1.36 billion in revenues from the underpricing of mining assets that were sold offshore to companies linked to Gertler (“United States Sanctions Human Rights Abusers”, 2017). Glencore likewise was put under criminal investigation in the US, UK and Switzerland for dealings with Gertler, namely the case of 128 million euros, following his sanctions (Moshinsky, 2015).

Sanctions from the US should have been a financial death sentence for the billionaire, as neither he nor any of his assets, or companies in which he had more than a 50% stake could no longer do business in the US. Under this act 34 individuals and entities associated with Gertler were sanctioned, and therefore could not do business with US companies, were cut off from the US dollar system, and Gertler could not travel to the US. However, a subsequent report that was a joint effort between organizations Global Witness and Platform to Protect Whistleblowers in Africa found that Gertler was able to circumvent US sanctions through the use of money laundering schemes and shell companies, particularly implicating Afriland bank. It was found that between June 2018-May2019, USD 100 million flowed through the shell accounts that he made, and 70% was deposited as cash. However, because of the nature of these types of schemes, it is extremely difficult to concretely attribute these accounts to Gertler, and all parties involved deny everything, claiming that the opening of these accounts and investment in Congolese currency shortly after sanctions were imposed were simply coincidental.

In response to allegations about money laundering schemes and the limits of US sanctions, an article published in Bloomberg business reads: “informal linkages offers a view into what might be described as the last mile problem for financial sanctions regimes. Regulators in Washington can impose weighty know-your-customer obligations on banks like Citigroup. But on the fringes of banking, in the corners of the world where corruption runs rampant, rules based on legal concepts like beneficial ownership or majority control can seem ineffectual in the face of personal loyalties, unwritten obligations, and impenetrable corporate records. In the end it’s a system that depends on whistleblowers to expose the truth.”

Part 6: Review of Existing Legislation, Initiatives, and Propositions

The Democratic Republic of Congo has long been on the radar of larger economic powers such as the United States, China and the EU, as well as some corrupt international actors, as seen with Gertler. Consequently, it has been subject to international legislation aimed at promoting development and peace in the country through the regulation of economics and businesses, particularly in the mining sector. One of these pieces of legislation was section 1502 of the Dodd Frank Act, passed by the United States Congress in 2008 in response to the conflict minerals in the eastern provinces of the Congo.

The Dodd Frank Act was principally an economic strategy to decrease the flow of capital into markets that were connected to violence (Whitney, 2015). This was done as a response to public pressure for accountability in manufacturing, as they were receiving bad press from organizations like Amnesty International for the sourcing of their coltan. Coltan is mined in the northeastern provinces of the DRC, in North Kivu, the area that borders Rwanda. Different militia groups, like the FDLR (Democratic Forces for the Liberation of Rwanda, ethnically Hutu militia), and the CNDP (ethnically Tutsi) among others protected mines and demanded a tax from the artisanal miners that worked in the mines. This tax could be in the form of the mineral ore itself, food, or money. The militia groups likewise contributed to ethnic violence in the region, with some groups plundering food from local villages by force. The violence in this region began with the Rwandan genocide and African Civil War shortly after, and the area remains unsafe. This has caused a large refugee crisis in the Congo as well, and many Congolese people have resorted to making charcoal from the trees of a nearby national park and selling it on a subsistence basis (Eichstadt, 2011).

The supply chain for the sale of coltan involved local villagers who worked in dangerous conditions in the mines who would sell to négociants in the village. The négociant would then sell to buyers and exporters (comptoirs) in provincial capitals, like the capital Kinshasa to the west. These comptoirs would then sell the ore to mineral traders, often freeland buyers for global mining companies (Eichstadt, 2011).

The Dodd Frank Act was not designed to solve the underlying conditions that perpetuated the violence in the Kivu provinces, nor was it designed to change the supply chain. Rather it was aimed at decreasing violence by decreasing the size of the markets that directly funded the violence (Whitney, 2015). This was attempted through due diligence practices and efforts to trace the source of coltan through the supply chain. However, due to an ineffective government and lack of infrastructure, these due diligence practices were difficult to implement and enforce. The off the books nature of the supply chain from the local villager artisanal miner to the global mining company further complicated the situation.

Based on the intent and design of the act, the size of the black market did decrease and there has been a decrease in violence in the Kivu provinces since the act was first passed (Whitney, 2015). However, the Dodd Frank Act has come under scrutiny because of its unintentional victims: the artisanal miners. If there is increased due diligence practices as part of new regulatory processes for anti-corruption, it is easier for companies to simply not source their minerals from the Congo at all than to make sure that they were sourced from nonviolent areas in the Congo. This decreases the demand for the mineral in the country, and affects the artisanal miners who work on a subsistence basis. Unfortunately for the Congolese people in the area, the artisanal mining sector is one of the best ways to have employment. Increasing regulation of the

selling of coltan implicates these destitute actors that desperately need a way to support themselves.

Another initiative that came into being following international action and call for due diligence practices was the Extractive Industries Transparency Initiative, enacted in 2010, which was designed to make corruption riskier, give incentives for public officials to act cleanly, and increase the sustainability of corporations (Garrett & Lintzer, 2010). The aim of this initiative was to enforce and encourage revenue disclosure so that there could be a way for different levels of the supply chain to verify (for themselves and for their customers) that their products were not implicating corrupt markets. While transparency initiatives are essential when considering tracking the global supply chain, which grows increasingly complex in this ever tightening world, the political and infrastructural situation in the DRC poses practical limitations. In the case of the DRC, there is a lack of coordination between different tax agencies, and due to an absence of a unique tax identifier code, mining revenue chains are difficult to track (Garrett & Lintzer, 2010).

The International Monetary Fund has also been used to try to promote development and economic sustainability in the DRC through the use of different programs and loans. While its structural loans during the 1980's did not age well, it gave its policies a face lift and has poverty reduction programs and rapid credit facility loans, which are given on more of an emergency basis. While these loans can be helpful in the short term, they are only as effective as the government's ability to use the funding to actually help its citizens and infrastructure. Furthermore, it perpetuates a historic trend of having "developing" countries be dependent on western powers for their functioning, like with imports of food and other goods.

A paper published in 2010, “Can Katanga’s Mining Sector Drive Growth and Development in the DRC?”, discusses the possibility of the development of a mining sector in the DRC that could fuel progress in the country, as seen with Chile. This paper examines two main components of the mining sector in regard to its relation with state revenue and wellbeing—fiscal contribution and economic linkages. At the time of publication, the state was estimated to capture less than 20% of legal revenues, and a senate report lamented tax fraud. It has been found in the mining sector a pattern of rent-seeking behavior, which in economic terms means profits from an industry that are not necessarily earned, such as with Dan Gertler. Therefore, any examination of the fiscal contribution of the mining sector must be coupled with policies that discourage rent seeking practices.

The paper refutes the historical idea of a “natural resource curse,” also known as the paradox of plenty, which associates natural resources with slow economic growth and armed civil conflicts. Rather, the paper points to poor economic practices that have led the economy of the DRC to become dependent on primary exports, which have in turn dampened growth. Additionally, the paper states: “any sector development strategy needs to look beyond mining reform, but has to link to and support a process of political reform. Without political reform the mining sector’s development contribution will be limited and can, in the worst-case scenario, lead to a net shrinkage of local economies, if it displaces economic operators such as artisanal miners without investing in alternative economic activities” (Garett & Lintzer, 2010).

Thus, the paper also focuses on the development of economic linkages. An economic linkage is a sector that is dependent on the existence of the mining industry without being an active part of the mining supply chain. These would be the transportation sector that transports materials for the mines, or agriculture to feed the miners, things of that nature. These fiscal

linkages are important for the diversification of the economy, making it more resilient against price shocks, as the value of revenue from mining is inherently dependent on the market price of minerals.

In the end, the paper is optimistic about the prospects for the potential power of business reform in Katanga's mining sector, stating that the World Bank suggests a private sector led mining sector could, within ten years, contribute 20-25% of GDP and one third of total tax receipts. However, it continually emphasizes the necessity of simultaneous business reform and improvements in government infrastructure and accountability. Since the publication of this paper, new mining reforms were passed by President Joseph Kabila (shortly before he left office) in 2018, which includes an increase in royalty rate for strategic substances and taxes on "superprofits"—leading to tensions between the DRC and international investors (Montembault & Adao, 2018). The industry is still recovering from the implications of these new mining codes, however some are hopeful, and the vice-president of the Chamber of Mines said that the "new mining regulations has created a new tier of sub-contractors which has created an emerging middle-class which is further helping to boost socio-economic conditions in the country" ("DRC Mining Code: Addressing the elephant in the room", 2019). The new mining code also decreases the length of duration for exploitation licenses, and dictates that 10% of the shares in a mining company be held by Congolese citizens. The code was annotated in July 2020 following tensions between mining giants and the DRC, and the relative success and effectiveness of these new mining codes have yet to be seen, given their recent passage.

A paper published in the *Journal for Human Rights* proposes a different solution for the cobalt industry in the Katanga province that instead focuses on the support of the artisanal mining sector. This solution is actually based on Rentier state theory and obsolescing bargaining

theory, stating that if the Congolese people held a larger stake in the global mineral trade, they could use the mineral trade to directly benefit the people. Multinational companies and transnational companies operate the large mining operations in the Katanga province. The profits of these endeavors do not go back into the development of the country through one form or the other, be it corruption or tax evasion, and the government and companies mutually benefit each other. As the people of the Congo do not own any stake in this situation, they do not have a say in the way that the funds generated by the mineral trade are being spent. The artisanal mining sector, the paper argues, is the stake held by the community. Similarly, the artisanal miners in the Katanga region mine on a subsistence basis, selling directly to Chinese mineral processors in open markets. This paper proposes increasing investment into the artisanal mining sector (while simultaneously improving conditions) and thereby increasing the size of the stake held by the community in the cobalt mining sector. In theory, this should shift the foundation of the Rentier state in a direction that favors Congolese communities.

In summary, existing legislation first focused on the establishments of due diligence practices to achieve transparencies across supply chains (Dodd Frank, Extractive Industries Transparency Act) in response to consumer concern about conflict minerals. Subsequent papers also proposed the restructuring of business and economic practices so that the mining sector could be used to benefit the state and the Congolese people, especially following accusations of corruption in the industry. In 2018, new mining codes were passed, which indeed seem to be aimed at the development of DRC's economy to benefit the Congolese citizens. In all cases, the artisanal mining sector has not been directly supported in any piece of legislation I have come across in my research, despite the assertion in the 2018 paper in the *Journal for Human Rights*

that the artisanal mining sector is the most direct way to support mining communities in the Katanga region.

In my opinion, however, there is a need to move beyond existing systems to achieve a mining industry that is ethical and sustainable, yet still able to fuel developments in technology necessary for a green energy transition.

Part 7: Conclusions and Discussion

I think that given their first peaceful transition of power since 1960 and recently passed mining reforms, the DRC, through economic reform and international accountability in supply chains, can use their critical natural resources to benefit their country. This can move the global supply chain in a direction where the average consumer is not implicated in the perpetuation of colonial relations, but rather is an agent for sustainable development in disparate corners of the world. However, this process must first start with the dismantling of unsustainable systems that have long been unquestioned.

The economics that fueled the culture of materialism arose from an unsustainable economic system with policies that viewed resources as infinite and state well-being as based on profits. This growth was only made possible from low cost exploitative labor—whether that was in the form of slavery, sweatshops, or child labor. As global networks of trade and international investment became much more important, those who made the goods that filled the superstores in the strip malls of America, the gadgets and new electronics of the 1980's, came from places people never had to think about.

We are now in a political climate, both nationally and internationally, that responds to public criticism of human rights atrocities. This has been made possible by the emergence of international watchdogs for human rights like Global Witness and Amnesty International, among many others. These entities, through mainly marketing and appealing to consumer ethics, can put pressure on companies to be accountable for the sourcing of their products and human rights. In the age of information, our economy has shifted such that the attention and fancy of the consumer has become much more important.

This accountability, in addition to strategic and transparent business management that promotes the development and creation of a national economy, can in turn promote industries such as local agriculture that can provide for community needs, decreasing reliance on imports. Going back to Rentier state, the growth of the local economy and capita per person income will likewise increase the amount that the government is dependent on the taxes from the people, and theoretically should be more responsive to community needs. But regardless of whatever legislation policies are in place, the most meaningful change will come if international business and trading ethics are universally established with stricter guidelines to ensure that innocent actors in a global economy are protected.

I think another thing that deserves to be brought into question is the structure and existence of hedge funds insofar as they enable economic behaviors and practices that implicate large populations, but not the person who ultimately controls the flow of money. The global economic system is relatively young compared to the other institutions that are involved in the question of the cobalt industry. Hedge funds are not regulated by the SEC, as some limitations on hedge funds are that they are not allowed to market, and are not allowed to take money from the public. Due to this, hedge fund owners already have to possess a significant amount of capital going in. Unlike a traditional mutual fund, where the owner has a certain percentage of the fund, hedge funds entail larger management fees (1-2%), and the owner gets 20% of the profits of the fund. A major critique of hedge funds is that as the owners take a large percent of the profits, it incentivizes risk, while the owner does not take a fall as their gain is dependent on profits, not the funds in the account.

The implications of hedge funds and legislation surrounding practices like money laundering are relatively recent. Although money laundering was first seen in the United States

during the 1930's (with Al Capone and his quarter operated laundromats, hence the name), it was not made a crime in the United States until 1984. Furthermore, the consequences of a fund becoming "too big to fail" were not fully felt until the financial crisis of 2005. If there is anything that I have taken away from the intersection of my original research questions with global economic structures, it is that when considering solutions to complex problems such the supply of natural resources and global supply chains, multiple systems must be actively questioned and dismantled if we are to achieve ethical and sustainable practices across all levels of the supply chain. It is not just how these systems work, what they are rooted in and what they are fueled by; rather, the more pressing question is how are these systems related to each other, where do they intersect, and how do they fuel each other.

Global poverty enables destructive economic practices through low cost labor. Low cost labor results in the artificial lower price of materials, and the resulting supply and demand balance stimulates profits, and encourages materialism in the states that benefit from the exploitation of the global supply chain. Having a society that was founded upon the norm of materialism and glorification of abundant opulence sets a standard of the perceived "civilized state" that is ultimately unsustainable and not possible in today's conditions. The perpetuation of these structures further fuels the degradation of the planet through monocultures and land use for other natural material extraction. Likewise, the seizing of land from indigenous peoples for development takes away land that used to be used for sustainable agricultural practices, which was often actually regenerative. Taking away land that was formerly used for local agricultural production in favor of cash crops, as Humboldt critiqued in his books following his travels through South America in the early 1800's, usually entailed a subsequent increase in dependence on imports for food. This implicated the food supply of nations, as the trends in global market

prices dictated the value of their natural resource exports and revenue. This is the force behind the manmade famines in many “developing” nations today.

Furthermore, my perspective as a geology student informs my understanding of the value of the mineral resources that are essential for a transition to clean technology, if such a thing really exists. We define eras in history by the mineral resource that was utilized in the making of technology—the Bronze Age, the Iron Age. Yet there is a disconnect between the understanding of the processes that formed these materials and the way they have been used in technology. Our economic systems, which in turn inform product design through the forces of supply and demand, were originally formed with the assumption that resources are infinite. The concept of finite natural resources and the intersection between manufacturing and the destruction of the environment did not exist when many of the economic structures and practices came into being that are still in use today. This is what a scientific perspective coupled with a historical analysis for context provides when looking at issues of natural resources and supply chains.

Perhaps there is a way forward if the laws of supply and demand can be applied in a way that incentivizes product design that conserves materials. If the price of minerals and ore actually reflected their true cost—considering the specific geologic conditions needed for their formation, paying miners and other workers livable wages, and mitigating environmental impact—would this change how products are designed on an industry level? Imagine if instead of planned obsolescence and the norm of replacing technology frequently for newer and improved versions, products were designed with anticipation of improvement and maintenance. Individual components could be swapped out for newer and more powerful parts, while the original parts go back to the company to be recycled. This would conserve materials, would

supply specialized jobs, and would foster healthy competition for innovation in recycling and design.

I think it is easy to condemn industry practices that negatively impact the lives of people and implicate the future of the planet. It is harder to take a step back and analyze the many moving parts that contribute to an ongoing problem of global poverty, inequality and climate change. I personally do not think it serves anyone to simply boycott supply chains that make consumers uncomfortable because of proximity to human rights abuse. Cobalt in the DRC is not going anywhere. The demand and need for innovative technology to shape a future that will hopefully be less destructive for our planet is also not going anywhere. Therefore, the only way forward is to address existing power structures that perpetuate these problems with a framework of accountability and reconciliation. This requires coordination and collaboration across seemingly disparate industries and academic disciplines—geologists, sociologists, anthropologists, historians, artists, writers, businessmen, economists. But I think if there was ever a time where this type of change is possible, it is now.

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