Spring 5-20-2023

Conflict and Coltan: Resource Extraction and Collision in The Democratic Republic of the Congo and Venezuela

Jenna Marie Goldblatt

Conflict and Coltan: Resource Extraction and Collision in The Democratic Republic of the Congo and Venezuela

Jenna Goldblatt
jgoldblatt3@fordham.edu

International Studies and Environmental Studies Senior Thesis
Global Affairs Track

Advisor: Dr. Meir Alkon, Ph. D.
malkon@fordham.edu

Abstract

Resource extraction has played an essential role in shaping human development and is an essential tool for technological improvement. However, resource extraction is also inherently exploitative of the environment, and therefore of people. This paper evaluates the relationship between Coltan, a mineral necessary for the creation of electronic capacitors, and the conflict it creates locally, regionally, and internationally through the case studies of the Democratic Republic of the Congo (DRC) and Venezuela. These case studies illustrate the relationship between export and consumption based countries and how this relationship keeps "developing" countries in a never ending cycle of development, and developed countries in a cycle of constant dependence. Given the complex relationship between export and consumer countries, the comparative case studies of the DRC and Venezuela help illuminate different layers of the resource curse especially in context of rare resources like coltan that are necessary for tech development and the green energy transition. Although policy will aid the transition to sustainable use of coltan, in its current iteration, coltan mining keeps society trapped in a cycle of conflict given that the export is necessary for funding developing countries while its use is necessary in technological development. Yet, the associated conflict creates instability at every level of society. Therefore, multi-prong policy with a focus on national investment and infrastructure development, supply-chain transparency, and global accountability is necessary.

Table of Contents

Introduction

Oftentimes human conflict and environmental problems precipitate one another, yet their relationship is complex and interdependent. When considering the causes of international conflict, many turn to blame political instability due to authoritarian rule and ethnic conflict. Although conflict is fueled by political instability, this instability can be directly linked to the resource extraction and environmental degradation in the country. Currently, the global economy and the future of development are dependent on resource extraction, especially on rare minerals like coltan which are essential for developing technological capacitors used in computers, plans, wind turbines, and even military missiles. Developing nations often rely on resource extraction of minerals like coltan to aid development, while developed nations rely on these exports to improve and increase competitiveness of their own industries. Coltan, given its relevance to technology, is one of the most in demand resources of the 21st century and its reserves are currently worth trillions of dollars. There is a significant power struggle for control over the reserves and profit, causing widespread violence within nations and across regions, and between international communities. The Democratic Republic of the Congo (DRC) and Venezuela exemplify this dilemma.

I explore the relationship between coltan as a driving force of conflict at a local, regional, and international level. Oftentimes the conflict associated with resources is limited to a local or regional context, especially in developing countries. How does coltan mining in the DRC compare to coltan mining in Venezuela? How does this mining affect the larger Central African and South American regions? How does coltan mining impact global stability by driving internal state and external international conflict? How is local conflict driving international conflict? How is international conflict driving local conflict? How do different regional uses of coltan affect conflict? What methods do human actors use to control the mining process and how does

this affect the global flows of the mineral resources? Are there alternatives to coltan and if not how can policy solutions address the ethical problems with the current situation? Given the potential for economic improvement, but also violence, does coltan extraction assist with a transition from "developing" to "developed" nation?

Given the complex relationship between export and consumer countries, the comparative case studies of the DRC and Venezuela help illuminate different layers of the resource curse especially in context of rare resources like coltan that are necessary for tech development and the green energy transition. Although policy will aid the transition to sustainable use of coltan, in its current iteration, coltan mining keeps society trapped in a cycle of conflict given that the export is necessary for funding developing countries while its use is necessary in technological development. Yet, the associated conflict creates instability at every level of society. Therefore, multi-prong policy with a focus on national investment and infrastructure development, supply-chain transparency, and global accountability is necessary.

Theoretical Framework

Levels of Conflict

The United Nations Interagency Framework Team for Preventive Action determined that, "conflict arises when two or more groups believe their interests are incompatible" ("The United Nations Interagency"). Contrary to its association with brutality, conflict is not inherently negative, as non-violent conflict backed by trust in governing structures and social institutions, "can be an essential component of social change and development, and is a necessary component of human interaction" (TOOLKIT AND GUIDANCE 1). In fact, non-violent conflict, backed by trust in governing structures and social institutions, can be vital for aiding social change and drive development. However, when groups do not have this trust the structures in place to manage and resolve conflict give way to violence. Often, "societies with weak institutions,

fragile political systems and divisive social relations can be drawn into cycles of conflict and violence" (TOOLKIT AND GUIDANCE 1). Given the multifaceted elements of conflict and the complications to international peacekeeping, conflict most often creates violence. Although there are not always clear distinctions between where a conflict begins or ends–physically or ideologically–there are often boundaries that define and limit its influence. In most instances, conflict can be best understood by its impact in a local context, a regional context, or an international context.

1. *Local Conflict*: According to the United Nations Department of Peacekeeping Operations (UNDP), in a general sense, local conflict "involves violence or the risk of violence centered at the subnational level" (Donati et al. 11). Oftentimes, the violence is perpetrated "through informal or loosely-organized structures and social groupings at the community level … includ[ing] local self-defense militias, for example, with relatively flexible in-group membership, more limited resources, and comparatively constrained offensive military capacities" (Donati et al. 11). In more simple terms, local conflict is a dispute or disagreement between parties within an individual group or agency (but not necessarily a singular state). Although the physical boundaries of a local conflict are more limited, these conflicts are incredibly disruptive to state stability and security, as the UNDP has found that, "localized violence is likely to generate more casualties than any other type of conflict driver" (Donati et al. 12). To maintain clarity in the paper, local conflict will refer to conflicts within a singular nation or general geographic area.
2. *Regional Conflict*: The International Peace Academy (IPA) defines regional conflict as conflict that consists of, "interconnected wars among adjacent countries that are mutually reinforcing and therefore typically protracted" and have "transborder linkages" (Cater 1). Regional conflicts involve many states or nations and transcend ideological, political,

economic, social, and military borders. However, regional conflicts are limited to geographically linked areas, such as Western Africa, Eastern Europe, or Southern Asia. Regional conflicts involve multiple states' active involvement in violence. Although "spill over" from civil war or local conflict can spur regional conflict, there are typically existing tensions and underlying problems. The IPA notes that, "regional conflict formations are typically characterized by fundamental, interconnected networking and processes within a region: institutional weaknesses of one or more states, regional security competition, a parallel and transnational informal economy, transborder social networks, illegal trafficking and trade, natural resource exploitation, militarization and arms transfers, and transborder armed groups" (Cater 2). To maintain clarity in the paper, regional conflict will refer to conflicts between states in different regions.

3. *International Conflict*: The International Committee of the Red Cross (ICRC) defines an international conflict as conflict that, "occurs when one or more States have recourse against another State, regardless of the reasons or the intensity of this confrontation. No formal declaration of war or recognition of the situation is required." Per the Geneva convention, "an international armed conflict is an armed conflict between two or more states." In more basic terms, an international conflict is one that involves multiple states or international organizations, these conflicts are commonly called transnational conflicts (Wright 1). To maintain clarity in the paper, international conflict will refer to conflicts between states in different continents.

As seen in 2023 different ongoing conflicts interact within states, across regions, and internationally. While many appear contained, ramifications of these conflicts, such as the Russo-Ukrainian, are felt around the world. As found by the UNDP, "Post-conflict

societies often face large-scale returns of displaced persons, including refugees who had temporarily fled to neighboring countries to escape violence" (Donati et al. 12). This reinforces that local, regional, and international conflicts are deeply linked and can often shrink, expand, and move at a rapid pace.

Mining

In order to extract these minerals, there are several different types of common extraction processes. According to the United States Geological Survey (USGS), there are three primary methods that are used for mineral extraction: underground mining, surface mining, and placer mining (occasionally referred to by different names or subgroups, but these are the largest and most expansive types). The type of mining used is dependent on many factors, such as the location of the operation, type of mineral being mined, and value of the deposit.

1. *Underground mining*: The Department of Environmental Protection (DEP) defines underground mining as the process of "opening one or more portals or shafts into the earth that follow or intercept coal seams that are too deep for surface mining methods" (Shapiro). The USGS states that underground mining is often used for higher grade ores that rest deep underground the Earth's surface. This technique is rather expensive, but preserves the quality of high grade minerals well. Generally, large tubes are drilled into the ground. Then the rock is blasted, brought to the surface, and then sent to be processed (Shapiro).
2. *Surface Mining*: In Shale and Gas Handbook surface mining, commonly known as strip or open-pit mining, is defined as "a process whereby soil and rock overlying the mineral deposit are removed (Zendehboudi). Strip mining is the process of mining a seam of mineral by removing a long strip of overlying soil and rock. Open-pit mining is the process of extracting rock or minerals from the earth

through their removal from an open pit or borrow" (Schlute). In general, the rock is drilled and blasted and excavated from the ground (Schlute). According to the USGS, surface mining is generally used for lower grade industrial minerals and metal ores. This process is less expensive, but the product is usually of lower value and closer to the Earth's surface.

3. *Placer Mining*: Historically, placer mining was used often and is a more traditional/basic mining method, defined by its use of water to "excavate, transport, concentrate, and recover heavy minerals from alluvial or placer deposits," which is a build of minerals in sediment. In placer mines, the sediment is usually washed and sluiced to separate the heavy minerals. This technique is associated with valuable and high-density minerals like gold and titanium ("Placer Mining").

Resource Curse

The Natural Resource Charter, an internationally recognized set of economic principles for governments and societies on how to best manage the opportunities created by natural resources for development, argues that "Countries with nonrenewable resource wealth face both an opportunity and a challenge. When used well, these resources can create greater prosperity for current and future generations; used poorly, or squandered, they can cause economic instability, social conflict, and lasting environmental damage." The Natural Resource Governance Institute (NRGI), a nonprofit organization dedicated to sustainable and inclusive development through natural resource governance, defines the resource curse, or paradox of the plenty, as "the failure of many resource-rich countries to benefit fully from their natural resource wealth, and for governments in these countries to respond effectively to public welfare needs." Although many

expect countries to improve development after finding and investing in natural resource extraction and export, " resource-rich countries tend to have higher rates of conflict and authoritarianism, and lower rates of economic stability and economic growth, compared to their non-resource-rich neighbors" (NRGI).

Conflict Minerals

The United States Securities and Exchange Commission defines 3TG, or conflict minerals, as "the metals tantalum (and niobium), tin, tungsten and gold, which are the extracts of the minerals cassiterite, columbite-tantalite, and wolframite, respectively." In this paper, the sole focus will be on columbite-tantalite, commonly known as coltan or tantalum. For the purpose of clarity, I will solely refer to the mineral as coltan. When refined, coltan becomes metallic tantalum and niobium, two metals commonly used in electronics. Specifically, the minerals are used to create tantalum capacitors, which are used in the majority of electronic devices, including smartphones, computers, airplanes, military goods, and more. The European Commission on Trade defines these minerals as "conflict minerals" because "in politically unstable areas, armed groups often use forced labor to mine minerals. They then sell those minerals to fund their activities, for example to buy weapons."

Artisanal Mining

According to the Organisation for Economic Co-operation and Development (OECD), artisanal mining is "largely informal [mining that] is associated with low levels of safety measures, health care or environmental protection." This style of mining is largely unregulated and used widely in developing countries as it mimics the simplistic style of placer mining. Generally, miners work with little to no gear, safety equipment, or supervision. The products are often sold illegally given how unregulated the process is and in turn the miners make very little

money (Blanco and Villaecija). It is especially used in individual run operations in African and Latin American coltan mining.

Literature Review

In this section of my thesis, I outline the existing literature relevant on resource extraction and its relationship to human conflict. I have a particular focus on the relationship between resource extraction and local, state, and international conflict and violence. I analyze the different types of conflict and the factors leading to conflict, specially between mineral extraction and conflict. In order to grasp how mineral extraction and conflict influence each other today, I examine the historical roots of mineral extraction, then I address the development of the mineral industry, discourse regarding the value of minerals in our society, ethical implications of resource extraction, and the link between conflict and resource extraction.

Historical Background of Resource Extraction

According to The National Geographic, mining has occurred throughout human history to extract natural gasses like propane and mineral resources, like copper and tin. Mineral mining, in its most basic form, is the process of extracting minerals from the earth. In prehistoric times, people mined flint, gold, and copper to use them for tools and weapons (National Geographic Society). Most minerals are naturally occurring in the Earth's surface. Minerals in their pure form are valuable, but are often physically mixed with rocks and other minerals. Therefore, procedures known as processing and refining occur to isolate the preferred minerals (National Geographic Society).

Importance of Minerals in Human Society and Development

Michael Duffy, the former chairman of the Federal Mine Safety and Health Review Commission, investigates how mineral resources and mining developed and influenced societal development in “What on Earth Are They Doing? Mining Through The Ages, And Its Influence on American Life.” He argues that mineral extraction and use has been incredibly influential in human development, defining entire periods of history (Bronze, Iron, and Steel ages) and setting the foundation for modern society (Duffy 21-23). Mining as imagined in the 21st century was established in the 19th century. However, there is significant evidence that Native Americans developed copper mining and trading around 7,000 years ago (Duffy 23). Minerals have been essential resources for trade, technology, and transportation. For example, coal was used by the first European explorers and to heat homes and fuel trains throughout the 17th and 18th centuries into the modern era (Duffy 23).

Distinguished political economy and public policy professor Darryl Reed similarly examines the historical development and impact of resource extraction on global industrial development, the economy, and society in his article “Resource Extraction Industries in Developing Countries.” As Reed explains, mineral extraction built the foundation of modern society and supported “the three industrial revolutions that have led to the modern economies of the developed world” (Reed 199). Human societies rely on these resources for virtually all physical and technological development, quickly depleting easily accessible mineral deposits. In order to maintain access to these necessary materials, there was a transition from small scale extraction sites to “large, vertically integrated, capital intensive transnational corporations characterized by oligopolistic competition” (Reed 200). This transition not only brought much physically larger operations, but also increased the size and control of ownership of extraction firms. Since easily accessible mineral deposits, those closer to the surface and in the host country of operation owner, had been largely emptied, in the last decade extraction efforts have expanded

globally (Reed 201). Resource Extraction Industries (REIs), the companies and businesses that oversee the extraction processes of raw minerals (i.e. the drilling of oil), in tandem with transnational corporations (TNCs) have facilitated the shift from domestic to international mining in the developing world (Reed 199). As the global economy becomes more deeply intertwined and interdependent, extraction operations expanded rapidly; this shift, and the international oversight and regulation, or lack thereof, has posed significant changes and challenges for the entire global economy and population. With this transition comes a multitude of potential ethical issues from operation ownership and management to labor standards and resource quality.

Dependency on Finite Resources

An important ethical and practical consideration is that the majority of these natural resources are nonrenewable or finite. Therefore, there is a long intellectual tradition of arguments surrounding human resource consumption and dependency on finite resources, such as oil, metals, and more. As explained above, natural resources are essential for the functioning of human society. However, currently humans have a much larger reliance on nonrenewable resources like oil and coal (roughly 80% of our energy supply) rather than renewable resources like wind and solar energy (National Geographic Society). As National Geographic outlines, the most substantial difference is that nonrenewable resources cannot replenish themselves (or will not within foreseeable human futures), which means there is no sustainable way to use them (National Geographic Society).

As seen with oil and coal, reliance on finite resources severely threatens state stability and the establishment of future development plans. Professor of Law and awarded researcher Patrick McGinley explores the true value and true cost of coal, one the world's primary sources of energy. Although coal currently is an accessible and relatively affordable source of energy, the

long term consequences of the product may challenge any existing value. McGinley references the economic findings of Paul Epstein's *Full Cost Accounting for the Life Cycle of Coal* and Julia Gohlke, et al.'s *Estimating the Global Public Health Implications of Electricity and Coal Consumption*, which state that the coal life cycle creates an unmanageable stream of waste and hazards. These costs are often considered "externalities" since they are removed from the coal industry's responsibility (McGinley 256-7). However, this economic panel estimates that these factors increase costs for "the U.S. public a third to over one-half of a trillion dollars annually … [as] many are cumulative" (McGinley 257). Even a conservative account of these damages "doubles to triples the price of electricity from coal per kilowatt hour generated, making wind, solar, and other forms of non fossil fuel power generation, along with investments in efficiency and electricity conservation methods, economically competitive" (McGinley 257). This line of reasoning can be applied to several other nonrenewable resources like oil and natural gas. However, even as developers and consumers become more aware of the numerous risks to the environment and public health, there is little movement toward reducing coal use or implementing carbon sequestration techniques from inside the industry; the majority of sustainability efforts come from "opposing" renewable energy efforts.

Ethical Dilemmas and Implications of Resource Extraction

The ethical implications and benefits of resource extraction have been debated for decades by academics across intellectual disciplines. As mentioned earlier, Michael Duffy discusses the complications and ethical dilemmas of the mining life cycle. First, the relevance of mining extends much beyond general comprehension since it literally "affects us from cradle to grave. From the tungsten filament that produces light in the delivery room to the granite tombstone that marks our final resting place" (Duffy 28). As mining practices have developed they have become safer, with environmental standards being implemented and deaths falling

from several thousand to less than a hundred annually. However, the massive wealth associated with mine ownership often drives carelessness with implementing health and safety regulation and encourages developers to turn to the "Global South" where regulations are more loosely enforced (Duffy 30-35).

Within the past twenty years, the ethical issues regarding extractivism and the role of developed vs. developing nations has been particularly relevant/exacerbated. As referenced previously, Darryl Reed's "Resource Extraction Industries in Developing Countries" examines the impact development has on these ethics issues and the potential policy responses to addressing or regulating them. The oligopolistic control, the complete control over a finite resource, REIs power can be threatened when new reserves are found. Therefore, suppliers will artificially limit supplies through contacts and buying competition (Reed 201). Even with the introduction of antitrust legislation, REIs have maintained an unbalanced and unfair control over resource deposits. As the Western controlled REIs, especially U.S. companies, expanded abroad, they "followed what might be considered a typical colonial pattern" by establishing extraction sites in Eastern Europe and Latin America while using Europe's technological advancements for refinement and processing in the U.S. (Reed 201). Given the constant changing of resource costs, REIs use the "least cost rule," meaning that they are constantly opening new operations and operating at whichever is cheapest. This allowed U.S. companies to maximize profit, while creating widespread instability since the host sites have no stable source of income or power to regulate international pricing (Reed 202). Additionally, as host countries democratize, mining undermines their efforts and legitimacy of state policy. As Reed notes, the control foreign bodies have on domestic policy and structure creates a "lack of opportunity for self-determination, critics would note, pertains not only at the national level, but also among particularly vulnerable population groups [such as] indigenous groups and other ethnic/racial minorities at local levels,

where its consequences can be even more devastating" (Reed 204). There are a myriad of ethical issues Reed and others point to, all of which are perpetuated by the "self-regulatory" approach by REIs and TNCs. This self-regulatory approach allows for REIs and the mining extraction industry to undermine state development and therefore the legitimacy, identity, and autonomy of host states.

As part of *Resource Curse or Cure?* renowned resilience co-researchers and professors Glenn Albrecht and Neville Ellis explore the "normative" view of resource development. They determine that the normative perspective is "implicitly seen as one of the positive dimensions of civilisation and progress" while ethical history "provide[s] opportunities to question and critique the path taken by all humans on th[e] most fragile of continents (Albrecht, Ellis). Albrecht and Ellis use Australia as a case study to highlight that in even developed nations extraction is exploitative of the environment and indigenous peoples.

In Author Richard Auty's "Mining Enclave to Economic Catalyst: Large Mineral Projects in Developing Countries," he establishes that the central criticism regarding multinational mining companies is the "political imbalance between large global corporations and weakened political states, which confers dubious long-term economic benefits on host countries" (Auty 4). In simpler terms, foreign mineral investments "are perceived to have an adverse impact on sovereignty, government ethics, local communities, and macroeconomic performance in the host countries" (Auty 5).

Conflict and Natural Resources

Given that natural resource extraction and export are such valuable industries, there is often conflict over control of the sources. NRGI explores this phenomenon within the oil industry, noting that, "since 1990, oil-producing countries have been twice as likely to have a civil war compared with non-oil-producing countries" (The Resource Curse). This has been

studied across countries in Africa and the Middle East. These countries are often affected by a phenomenon known as “Petro-aggression” or “ the tendency of oil rich states to instigate or be targets of international conflict” was observed in countries such as in Iraq following their invasion of Iran and Kuwait (The Resource Curse).

My Contribution to the Study of Natural Resource Use and Conflict

The existing literature largely details the ethical and environmental issues with coltan mining. However, coltan mining, especially in its current form, is not a necessary evil. My thesis seeks to understand the nature of the conflict that this mineral drives and establish the relationship between human conflict and coltan extraction. By understanding the multifactor issues driving conflict, policymakers can make more informed and effective decisions. Currently, coltan mining threatens not only the future of international stability, but also the future of renewable energy. Coltan is essential for the technological development of renewable energy resources like wind turbines. Therefore, it is imperative that coltan mining is restructured in a socially responsible and sustainable manner. Although irrevocable damage has been done, we are at a turning point in development since “there is a window of opportunity to help the long-suffering population of the Democratic Republic of Congo (DRC),” (Haynes and Burge). These authors outline a detailed set of recommendations that the DRC and foreign bodies could begin to implement immediately, underscoring that by working on infrastructure building and conflict resolution, extraction can be managed in a more sustainable way. Yet as reported by the Wilson Center, “If the DRC fails to adopt and enforce stricter regulations to protect small-scale miners, these trends will increase alongside the technology-driven surge in cobalt demand, projected to grow by 60% by 2025.” Additionally, no similar plans or literature is widespread regarding reducing mining in Venezuela or the larger region. Instead, China, one of the most coltan-dependent countries, recently “pledged mining-industry support to Chávez and to Brazil,

one of the biggest exporters of processed coltan" (ICIJ). Given the increasing need for coltan and its relevance to policy (regarding renewable energy, trade, immigration, etc.), this analysis will contribute to the larger research on the subject and encourage substantive policy changes.

Case Studies

Coltan

In many ways, Coltan mining is a culmination of the need for minerals and the problems they create. Coltan also uniquely defines much of the international and domestic conflict and threatens the stability of the entire renewables industry. Although the industry has existed since the 17th century, the recent practical increase has correlated to a significant increase in literature around the issue and is being added too often, reflecting the relevance of this issue. Despite being a relatively modern issue, the depth and extent of the existing literature indicates how applicable the dilemma of coltan mining is to both historical and modern examples of similar extraction discussed previously such as coal.

Rise in Popularity: "Coltan Fever"

In 2000 demand for the coltan industry peaked as it became an essential part of technological development. The mineral was used in new electronic devices such as mobile phones and video game consoles since it is essential to making computer capacitors. When Sony introduced the Playstation II, the market value of coltan skyrocketed as there was a global demand and shortage of the mineral. Within a year (from 1999 to 2000) the price increased over 12x skyrocketing from $30 to $400/ per pound. In the DRC, people from around the country migrated to the Eastern mining region. This phenomenon became known as the "Coltan Fever" ("Coltan and conflict"). However, this also drew the attention of rebel groups, militias, and other armed groups for its potential to fund their ongoing military plans.

Demand

Coltan reserves are limited, and it is only found in certain parts of the world, notably Central Africa, Australia, and South America. The main way coltan is extracted is through pit-mining. Miners dig large wells into the ground and then sluice the sediment to extract the mineral ore ("Coltan and conflict"). Given the relatively simplistic process and extremely high demand thousands of workers are employed by the industry. Although in many extraction host countries like the DRC and Brazil the wage is competitive as $10-20 per week, workers make an extremely small portion of the total profit, especially considering the risk associated with their work. The demand for coltan is growing because of the increase in demand for technology, including that use for green energy like solar panels.

As outlined previously, current society depends on coltan extraction for the production of essential technological goods like phones and planes. Therefore, it is extremely unlikely that the coltan industry will cease to operate. Moreover, it would almost eliminate the potential for a green energy transition. The mineral is needed to create solar panels, wind turbines, and hydroelectric dams. By eliminating coltan extraction, it would significantly limit society's ability to move away from nonrenewable resources like gas and oil.

The Democratic Republic of the Congo

Historical Context of the DRC

The Democratic Republic of the Congo (DRC)[1] is the largest country in Sub-Saharan Africa and borders several other Central African countries such as South Sudan, Rwanda, and Zambia. In 1885 the DRC was colonized by Belgium when King Leopold II created and

[1] It is important to distinguish that The Democratic Republic of the Congo (DRC) and the Republic of the Congo (the Congo) are two completely separate countries. The DRC is associated with the name Congo-Kinshasa while the Congo is associated with the name Congo-Brazzaville, in reference to their respective capital cities. Despite similar names the countries have never been unified, were colonized by different countries, and remain autonomous from each other.

controlled the Congo Free State (Crooks). The DRC became the personal property of King Leopold II through the Congo Society, rather than the territorial holdings of the Belgian state. Under the guise of a humanitarian "civilizing" mission, King Leopold II was able to directly profit from Congolese colonization. The country had large deposits of minerals such as diamonds, but was most famous for its rubber stores. In the 1890s King Leopold II created rubber plantations and exported the resource commercially. King Leopold II installed a militarized quota-based system of forced labor which destroyed the indigenous societies and social structures, decimated the land and resources. During this period over half the population died (approx. 10 million people), and millions more were left physically maimed, while King Leopold II was made enormously wealthy (Hothschild). As news of the brutality spread, mounting international pressure forced King Leopold to give the Congolese territory to Belgium in 1908, making it the "Belgian Congo" (Crooks). A series of complex nationalist and political movements brought independence.

After being colonized by Belgium from the late 19th century through the majority of the 20th century, the country was left underdeveloped and lacked essential infrastructure. Throughout the 20th century the Congo experienced very tumultuous transfers of power from colonial powers, to freedom, to regional wars, and oppressive leaders. After gaining independence from Belgium in 1960, the DRC was plunged into a state of political unrest and tumult until 1965. This period was known as the Congo Crisis, characterized by a series of civil wars across Africa and proxy conflicts related to the Cold War; approximately 100,000 were killed (Nwaubani 599). The country was temporarily known as the Republic of Zaire from 1971 to 1997. The leader at the time, Mobutu Sese Seko, made this change to reference the African name for the Congo River or "Great River" (Cordell et al.). This was partially an attempt to give the DRC a uniquely African identity in the wake of colonialism. Due to the build up of tension

from the instability and existing ethnic and regional tensions in the country, Zaire was extremely unstable and starting to fail. Spillover from the destabilization of Rwanda from the genocide catalyzed the Congolese Civil War (Prunier 38). In 1996 Rwanda invaded Zaire to pursue rebel groups, which quickly involved multiple African nations, such as Uganda and Burundi, and international military groups. Despite its conclusion only a year later in 1997, The First Congo War, nicknamed Africa's First World War, caused extensive ethnic violence and ruin (Prunier 52). A new government regime was installed by rebel leader Laurent-Désiré Kabila, who quickly reinstated the name the Democratic Republic of the Congo in reference to the colonial name referring to the indigenous Kongo people (Cordell et al.). Despite this political transition, there was limited tangible change within the DCR. President Kabila attempted to insight change within the nation by exiling the Rwandan, Ugandan, and Burundian military groups from the DRC and cultivating a new African coalition with nations such as Angola, Zambia, and Libya (Tamm). However, this instigated military retaliation from their former allies who invaded East Africa, driving the Second Congo War or Great African War in 1998. Much of the Second Congo War was fought over control of the nation's natural resource reserves and unresolved tensions from the First Congo War. For this reason, many consider the two wars to be a part of the same larger conflict rather than two distinct wars (Tamm).

A peace agreement was signed in 2002 with the Pretoria Accord and the war officially ended with the introduction of the Transitional Government of the Democratic Republic of the Congo in 2003 (Global and Inclusive Agreement). However, violence was widespread and brutal beyond official negotiation. Notably, there was much resistance and ongoing guerrilla campaigns led by armed forces such as Armed Forces of the Democratic Republic of the Congo (FARDC) the Lord's Resistance Army (LRA). There were widespread disputes between armed groups, such as clashes between FARDC, the national army, and other militia groups in the Kivu region.

Since its start in 1987 the war has created widespread violence and human rights violations; by 2008 almost 2 million people had been displaced and 5.4 million people had died, largely due to disease and malnutrition in the aftermath of violence (Bavier). Overall, the conflicts associated with the wars have been responsible for almost 6 million deaths (the deadliest conflict since WWII). Many of the root causes of the instability remain present today, such as ethnic cleavages, displacement, and lack of infrastructure. Adam Hothschild, historian and acclaimed author of *King Leopold's Ghost: A Story of Greed, Terror, and Heroism in Colonial Africa*, categorizes the time following Leopold's rule as "the great forgetting." With little resources and attention to document and share the atrocities they faced and in the face of King Leopold's campaign regarding his image, the world quickly forgot his inhuman violence and the suffering in the DRC (Hamilton). Even into the 21st century this "Forgotten Holocaust" often remains undiscussed which has perpetuated cycles of exploitation by the Western World (Hamilton). As of December 2022, almost 6 million people have been internally displaced due to the conflict, while there are over half a million refugees and asylum seekers in the DRC, and there are over one million refugees from the DRC seeking asylum in neighboring countries (DR Congo emergency).

Natural Resources and Coltan Reserves

Into 2023, the Congo remains socially and economically unstable. As the state fights to develop and create stability, it has turned to its abundant natural resources, but this is fueling a similar cycle of instability and violence. The country has one of the largest forest reserves in Africa which attracts the timber and logging industry, vast oil and gas reserves, gold and diamonds, and essential minerals for the energy and technology industries such as cobalt, copper, and coltan (Payanzo et al.). The DRC is also one of the most biodiverse countries in the world. The European Union Generalised Scheme of Preferences (EU GSP) estimates that the DRC's

natural resources are the most valuable in the world at an estimated $24 trillion (which will only increase over time due to scarcity). However, much of the conflict discussed previously has been funded by these mineral resources.

The DRC has the world's largest coltan reserves and as of 2021 is the largest producer, with an estimated 700 metric tonnes (MT) or ⅓ of the world's mined stock of coltan (Lalji). The reserve holds approximately 60% of the world's total coltan, meaning coltan is seen as a necessary industry for the country by internal and external parties (Lalji). This mineral is known as "black gold," given the global rush for control and its profit potential.

Extraction and Mine Sites

The DRC's mineral reserves are mainly found along the Eastern border. Many of the coltan mines run alongside and even into neighboring countries such as Rwanda, Burundi, and Uganda. Central Africa's "Copperbelt" runs through a similar region, so the region also has many copper and cobalt mines.

Historically, artisanal mining was the primary means of coltan extraction in the DRC. However, within the past five years more international firms have begun taking control of them. According to the Wilson Center, a non-partisan research and policy firm, artisanal miners are responsible for approximately 20% of Congolese coltan output, while foreign-controlled forms account for approximately 60% of global coltan demand. For example, the Bisie mine is a massive tin deposit in the North Kivu province (Reyntjens 533). Although the main product is tin, coltan can be found in tin slag, a byproduct of the tin refinement process. Originally, the mine provided 15,000 tons of tin or 4% of the total global tin production (Polgreen). However, this artisanal mining was declared illegal and shut down in 2018. Now, Alphamin Resources Corp., a Canadian owned company, is exploring the site.

The Rubaya mines or Bibatama Mining Concession is a set of mines also in North Kivu. These mines produce roughly 1,000 MT annually, which makes them the largest coltan producers in the DRC (*Clowes)*. About 3,500 artisanal miners work in these mines. The mining licenses are officially held by the *Société Minière de Bisunzu Sarl* (SMB). According to *Sofala Partners*, "a consulting group with a regional focus on sub-Saharan Africa," SMB purchases between $3 and $5 million worth of coltan each month from the miners (Nyirabihogo). However, the ethics and safety of this mine have been called into question as SMB is owned by Congolese senator Edouard Mwangachuchu's family. This ownership has been controversial and implicated in corruption and lax regulation, especially in the wake of miner deaths (Nyirabihogo). There are currently no nationalized mines and foreign investment is steadily growing.

The DRC is one of the most classically affected countries by conflict mineral extraction and is used as a foundational case study in a significant portion of research regarding state development, natural resource use, and mineral extraction. Since the beginning of the 21st century Coltan mining has been established in the DRC, making it one of the original and longest sites of extraction ("Coltan and conflict"). The country is also one of the five poorest countries in the world with 64% of its population living below the poverty line and 16% of the total Sub-Saharan African population in extreme poverty living in the Congo ("The World Bank in DRC"). Therefore, there is a significant relationship between extraction and conflict as extraction has exacerbated intense local, regional, and international conflict making this an "easy" case study.

Venezuela

<u>Historical Context of Venezuela</u>

Venezuela, officially called the Bolivarian Republic of Venezuela, is a country on the northern coast of South America (“Country Brief: Venezuela”). Venezuela was colonized by Spain from the 16th to mid-19th centuries, specifically for access to the country's rich natural stores of precious metals and minerals. Venezuela was colonized by Spanish forces in 1522 despite resistance from indigenous populations (“Country Brief: Venezuela”). In 1811, Venezuela was among the first countries in the Spanish Americas to declare independence and formed the Republic of Colombia as part of Gran Colombia (“Country Brief: Venezuela”). In 1830 Venezuela separated from the union and achieved sovereignty, yet maintained close ties with their regional alliances.

During the 19th century Venezuela suffered a period of intense political turmoil and instability marked by military dictatorships. However, in 1958 Romulo Bentancourt, or the “Father of Venezuelan Democracy” was elected and helped to aid the first democratic transfer of civilian power in 1963 (“Venezuela’s Chavez Era”). For over 30 years the Democratic government oversaw an oil-dependent economy; Venezuela has one of the largest stores of crude oil. However, corruption grew rapidly, and elections became severely limited between three main parties in the Puntofijo Pact (“Venezuela’s Chavez Era”). In 1989 the president at the time, Carlos Andres Perez, implemented the “Washington Consensus,” a series of free-market reforms designed to solve the economic crisis (Venezuela’s Chavez Era”). However, gas prices continued to sky rocket and civilians led riots across the country. Under Perez the national military brutally stopped the riots in the Caracazo, or “Caracas Smash” (Venezuela’s Chavez Era”). In official government reports less than 300 people were reported dead, yet the media found over 3,000 people were killed (Venezuela’s Chavez Era”). As Venezuela was plunged back into a state of social unrest and military crackdown, Hugo Chavez, a former military officer, began to form and recruit for his Bolivarian Revolutionary Movement-200. Chávez attempted two failed coups

against Perez, and although Chávez was imprisoned, he quickly gained charismatic legitimacy, creating a cult of personality. In 1994, Chávez was released from prison and started a presidential campaign centered around the promise to remake Venezuela's current political system and open up the political system. Between 1990 and 1994 Venezuela encountered five recessions, creating deep social fissures and increasing anger. Chávez's campaign was very popular, although in 2002 roughly 1 million constituents marched in protest of his appointments of political allies to PDVSA, a national oil company. Violence broke out and Chávez was overthrown by Pedro Carmona, conservative right-wing business leaders who dissolved Congress and suspended the constitution. The Carmona government was initially legitimized through U.S. recognition of its sovereignty, but it was quickly condemned by Latin American states. Chávez was reinstalled within two days, yet international distrust was brewing. In 2004 the record numbers of Venezuelans called for and voted in a presidential recall referendum, but Chávez remained in power despite accusations of corruption and fraud. Within the same year Chávez created a 2 million person civilian military reserve and ended a 35 year political allyship with the U.S. creating boycotts and international tension. Chávez then turned to strengthen ties with Iran, Russia, and China and made oil deals with neighboring Latin American countries and low-income areas in the U.S. Chávez won reelection in 2006, yet he quickly made controversial choices to strengthen his own party the United Socialist Party of Venezuela (PSUV), replace most of his cabinet, and nationalize the telecom and electricity industries, the Central Bank, and oil production. Chávez then made the radical decision to withdraw from the International Monetary Fund (IMF) and the World Bank and announce several new, very expensive, projects such as a transcontinental oil pipeline (Venezuela's Chavez Era"). Amid concerns regarding Chávez's spending and inflation he proposed a policy to abolish presidential terms along with other controversial policies such as expelling the U.S. ambassador. On his second attempt,

Chávez won a referendum removing Presidential term limits and made announcements to remain in power for decades to come (Venezuela's Chavez Era"). By 2010, high crime rates, food insecurity, and record breaking rates of inflation challenged his popularity and legitimacy. Despite opposition, Chávez won a fourth presidential term. Chávez died in 2013 after a battle with cancer and was replaced with his choice Nicolas Maduro; these election results were widely contested and led to widespread protest and instability.

By 2014 South America began to face economic collapse and Venezuela's GDP faced an extreme decrease (sharper than that of the Great Depression) (Kiger). In 2023 the country is experiencing an ongoing hyperinflation crisis with inflation at over 200% (Armas). Widespread poverty, hunger, and resource shortages broke out. Although Maduro won reelection in 2018 corruption and voter fraud was widespread.

The Maduro government has become known for its extrajudicial executions imprisoning opponents, persecuting civilians in military courts, torturing detainees, and police violence protesters (Roth). A U.N. Fact-Finding Mission (FFM) found that the patterns of violations and crime were "part of a widespread and systematic course of conduct that it concluded amounted to crimes against humanity" (Roth). The country is facing an acute humanitarian emergency as millions of citizens do not have access to basic human rights such as healthcare, food, and clean drinking water (Roth). The crisis has led to over 7 million (20% of the population) Venezuelan refugees and migrants since 2014 ("Venezuela Situation"). This is one of the largest migration crises in history. The country is fighting to gain stability and international political power as it has experienced "democratic backsliding" (a return to an authoritarian state) and humanitarian emergencies.

Venezuela and the Rise of "Blue Gold"

Venezuela is a less classically referred to example for coltan extraction, yet it is garnering international attention as conflict continues to expand within the nation, much of which can be linked to coltan mining. Although there is less published research on coltan in Venezuela, there has been a recent uptick of interest in the region. The world's second-largest store is found in Brazil, which produces roughly 470 MT and has 40,000 MT in coltan reserves (Roth). However, coltan mining is currently more established in neighboring countries, Colombia and Venezuela. Venezuela's coltan is commonly referred to as "blue gold" due to its extremely high commercial value, and its bluish color.

In 2008, Venezuela faced a massive financial crisis and a crash in oil prices. Therefore, in 2009 Chávez attempted to compensate for this financial downturn through mineral extraction. I Chávez announced the "discovery" of coltan in Western Venezuela. Although coltan mines were already legally operating, Chávez marketed this discovery as a turning point for Venezuelan industry. There was suspicion the Revolutionary Armed Forces of Colombia—People's Army (FARC) was using illegal coltan mining to fund their military exploits. Therefore, Chávez outlawed all private mining and sent over 15,000 troops in "Operation Blue Gold" to expel Colombian smugglers (Díaz-Struck et al.).

In 2018, Venezuela began legally exporting the mineral and started building the largest plant and first coltan concentration plant, set to produce 160 MT annually ("Venezuela Opens"). The reserve is located in Bolivar and will be controlled by the Venezuelan government and a state power consortium. Unlike in the DRC, most of Venezuela's mines are owned by the government or state firms, providing the country with the opportunity to use the trillions of dollars in reserves for national development and improved stability.

As attention to the mineral, and international pressures, increase, so do smuggling and displacement. The mineral poses a security threat to the stability of the region and larger

international alliances and trade deals. Coltan's impact is being directly felt in the country as exhibited by the extreme state violence and fight to control the mining industry.

Orinoco Mining Arc

The Orinoco Mining Arc is a large territory along the Orinoco River Basil, just under the Orinoco Oil Belt. The Orinoco Oil Belt holds the largest petroleum deposits while the Orinoco Mining Arc holds rich mineral deposits. The territory makes up over 12% of Venezuela and includes states such as the Amazonas and Delta Amacuro (Ebus). The Venezuelan government estimates that the region holds "$100 billion in coltan reserves (the metallic ore is, as well as three billion carats in diamonds, and at least 300,000 metric tons of rare earth elements" (Ebus). However, the region is also very rich in biodiversity and five national parks are located in the region. For example, Canaima National Park, a UNESCO World Heritage with completely unique mountain ranges and flora and fauna is at risk of being for mine development.

Analysis

Given the wealth of natural resources in both the DRC and Venezuela, these resources have traditionally been used to fund the ongoing wars and armed conflicts as well as state development in the wake of the destruction and violence. The armed groups such as official state forces and rebel groups have fought to gain control access to coltan mines. The mines are extremely profitable because of the valuable resources and cheap, easily extorted labor force. Additionally, smuggling the mineral is rapidly growing as the smuggled minerals avoid fines, certifications, and taxes. Moreover, given the widespread political corruption, bribery is often used to reduce regulation and policy enforcement of the mines. Therefore, the mining process is used to fund the ongoing internal and external conflicts within the DRC and Venezuela. However, it also aggravates conflict by exacerbating ideological divides, displacing large groups, degrading the environment, causing health problems, violating human rights, and threatening

national security. This then necessitates the expansion of mining to find the growing conflict creating a never ending, unregulated cycle of conflict expansion.

Human Rights Violations

From a human rights perspective, coltan damages the health, safety, and prosperity of miners and surrounding communities. Although mining practices are constantly developing, Coltan is mined in a largely unrefined and undeveloped process. However, more advanced processing plants are being developed which poses a new set of issues, as they are largely unregulated.

Since the industry is expanding so rapidly and holds potential for immediate financial gain, the Congolese and Venezuelan populations are easily exploited for cheap labor. As regulations become less clear, the already informal industry is able to abuse and exploit workers with few consequences. The lack of reinvestment from mining profits greatly hurts the protection of workers. Although the coltan mines are extremely profitable, most of the profits are privately pocketed by smugglers and militias and little money is used for developing national infrastructure and social services like hospitals and schools. As seen with the migration crises in both countries, civilians are severely suffering.

For example, child labor is a cheap source of labor for the largely unregulated industry. The Institute for Security Studies estimates that in the DRC there are over 40,000 child and teenage miners (Ojewale). In many parts of the country, especially more rural areas, there are significant barriers to education, combined with the high levels of poverty in the country, the seemingly lucrative extraction industry is very attractive to desperate children. Many of these children migrate to the mines from more remote areas for job opportunities that the mines provide. The unregulated and informal opportunities in the extractive industry provides a pathway for mines to use vulnerable children as cheap labor. Moreover, children are often placed

in extremely dangerous conditions as washers and diggers where they are often directly exposed to toxic material and unsafe conditions since they are cheap and easily replaceable (Sovacool). Although there are fewer official statistics on child coltan miners in Venezuela, child labor is a widespread issue across industries in the country, especially in Bolivar ("Child Labor and Forced Labor Reports"). Additionally, much of Venezuela's coltan development is based on Brazilian mining practices where child labor is a significant issue, especially in Bolivar (Roth). The Brazilian government has attempted to improve working conditions and end child labor in the mines. However, similar to Venezuela, political instability and corruption make it challenging to enforce these policies.

Moreover, since the mines are largely controlled through violence, most labor is forced. Although many people migrate to the mines for financial opportunity, the lack of options make this the only option. Additionally, workers are met with threats of extreme violence, forcing them to work long hours in unsafe conditions. Given the power structure of the mines, sexual violence and rape are widespread - the UN found that almost 30,000 girls were raped in North Kivu mines in 2006 alone (Schnurr and Swatuk). Young girls are often victims of sexual abuse, forced marriage, and early motherhood. For girls like Solange, a worker in a mine in North Kivu (DRC), she began working at 11 and was married by 14 (Tsongo). Her 'luck' caused animosity with her female co-workers who "envied" her success. By the time Solange was 15 she was a widowed single-mother and her supervisor quickly demanded a sexual relationship. When she attempted to deny his advances, her boss threatened to "dive [her] out of the mine zone," making her job increasingly difficult by assigning her to long journeys to sell coltan in neighboring areas. Desperate to support her family at home and her young baby, Solange agreed to pursue a sexual relationship with her boss for a less physically intensive job and more pay. However, Solange details that she felt like a "slave" and was "emotionally tortured," by the arrangement especially

after she was forced to bear his child (Tsongo). Solange says she has refused to continue the sexual arrangement with her boss and has been forced back into physically demanding jobs. Solange, like many others in this position, is physically isolated from her family, emotionally isolated from those she works with, and fears she will die working in the mines. However, even from an external standpoint workers like Solange currently have very few alternative options. At the mine Solange makes $21 (USD) a week working with no days off, and at less than $2 a day, her salary is competitive in the current Congolese market (Tsongo).

Coltan extraction exacerbates ideological divides and social cleavages, while worsening economic inequality and heightening resource competition. Given that the majority of coltan mines are owned by TNCs and foreign companies, the financial gains from coltan mining are highly concentrated and largely inaccessible to the majority of the population. In order to build these mines, many groups, especially indigenous people and rural communities, are being displaced from their homes. In the DRC the Mbuti Pygmies, an indigenous group of nomadic hunter-gatherers, have sustainably lived in the rainforests for hundreds of years (Coltan Mining a Continued). However, they are facing massive violence and displacement as the forest is lost and groups fight over control of their land. The coltan industry threatens their very survival and could rapidly lead to their extinction. In Venezuela, the increased development of the Orinoco Mining Arc, threatens to displace significant portions of the 1.6 million inhabitants of the region or 5% of Venezuela's population (Menéndez). This is problematic because it destroys ancestral lands, disrupts settlement structures, and drives people into Venezuela's already highly concentrated urban areas, further destroying indigenous practices and forcing assimilation ("Indigenous peoples'" 8). According to the Center for Strategic & International Studies (CSIS), the expansion of the mining industry has affected land in the Alto Orinoco-Casiquiare Biosphere Reserve, the protected home of the Yanomami people and other indigenous people. This not only destroys

protected land, but also violates existing agreements regarding environmental preservation and land rights in this area. 34 indigenous groups that live in this region of Southern Venezuela have been heavily affected and deeply involved in the policy regarding mining. However, the Maduro regime failed to consult them before “implementing public policies to promote mining in the region” (Rendon et al.). These conditions have pushed "approximately 500,000 workers are involved in illegal mining operations, many of them from local indigenous communities who have been coerced into working through threats of violence or due to economic necessity. These miners mostly are impoverished Venezuelans, and an estimated 45 percent are underage" (Rendon et al.). Despite indigenous resistance, they have faced violent repression and been forced to “flee their ancestral homes” (Rendon et al.).

Environmental Degradation and Land Loss

Since 2012, the mines in the Congo have shown “hole[s] in the canopy,” as the region is deforested (Kaye). The Congo Rainforest is the second largest rainforest in the world and makes up 18% of global tropical jungle. The country is a biodiversity hotspot and rainforest is home to over 10,000 species of flora and fauna. However, mineral mining is causing rapid deforestation as singular mines require large amounts of deforestation.

Furthermore, the human displacement in the DRC and Venezuela, is also contributing to massive land degradation and disruption of ecosystems. Coltan mining destroys many natural ecosystems, wildlife habitats, and habitable land for humans. Locations for coltan mining are picked unsystematically and often miners devastate forested areas and national parks. For example, the Congo’s Kahuzi Biega National Park, a very biodiverse and protected area, has been significantly impacted by mining (“Kahuzi-Biéga National Park”). The mines displace

native flora and fauna, including the endangered mountain gorilla. These animals become very vulnerable to poachers and biodiversity is being lost at a rapid rate. Alongside the habitat degradation, many of the wildlife are being used as sources of sustenance for miners. Given the refugee crisis and isolated rural landscape of many mines, there is large amounts of food insecurity and malnutrition, especially among children. Therefore, mining communities have been forced to consume animals they have historically protected and other "bushmeat" as a last resort. This has taken a significant toll on critically endangered animals such as the Grauer's Gorilla. The gorillas are large and travel groups, making them easy to track and valuable sources of meat. However, while there were "17,000 Grauer's gorillas in 1995, only 3,800 individuals remain—that's a 77 percent drop in the population. And every single wild Grauer's gorilla left resides in the conflict-ridden DRC" (Plumptre et al.). Although ethically complex, the involuntary consumption of these animals constitutes the kind of political violence that forces people to sacrifice customs, values, and ways of life to survive.

Also, the chemicals involved in the coltan extraction and processing leach into the ground and water sources, creating pollution and ruining freshwater resources and polluting animals and plants. Expanding coltan mines leads to increased flooding, degraded soil, plantation systems, the draining of groundwater reservoirs, and increased runoff — all of which further disrupt the water cycle (Reetsch 16). Between draining local water supplies and causing the natural production of less water in the area, not only is water less available, but the quality of the water available has decreased significantly. Local water sources went from clear and widely safe to drink to a dark murky mud color, filled with dirt and debris (Reetsch 19). Overall, the extraction of coltan damages the natural water cycle, forever changing the landscape of an area even after a mine has been closed (Reetsch 20).

Threats to Public Health

Although coltan mining has not been active for a long enough time to understand the long term health effects, the health of workers and local communities are already suffering. At the immediate local level, miners are often crushing and processing mineral ore, exposing them to damaging dust particles in the air which often leads to respiratory problems (Leon-Kabamba, Ngombe et al). Handing these minerals and processing chemicals can also expose individuals to large amounts of radiation, causing physical ailments such as rashes and burns (Mustapha, A O et al). Workers are also exposed to radioactive materials such as radon, uranium, and thorium daily which is linked to causing cancer, especially lung cancer (Lubin, J H et al). There is also risk of exposure to chemicals including cadmium which is known for affecting reproductive health and fertility as well as causing birth defects (Zava).

The mining also presents significant regional threats. Extraction and production of minerals is extremely fossil fuel intensive, and the techniques directly degrade soil, air quality, and water sources. Over time, the mining also leaches toxic metals into the water and soil, creating a buildup of toxins killing plants, animals, and humans. Although unknown, the long-term environmental impacts are estimated to be devastating. For example, mercury has seeped into soil and water systems, which already affected indigenous populations and exposed them to dangerous levels of the chemical element. In the Venezuelan Caura river basin, a tributary to the Orinoco, "92 percent of indigenous women had elevated levels of mercury, which could damage the kidney and brain and impede fetal development" (Rendon et al.).

National Security

Local Conflict: Armed Groups

In both the DRC and Venezuela mining groups present serious threats to national security. Currently, in the DRC there are over 40 active armed or rebel groups ("DR Congo: Army Units"). These groups present a serious threat to state security and mining security. As

highlighted above, gaining control over coltan mines is an essential way to fund military operations and organized violence. Despite counter-insurgency operations by both the Congolese army and the UN, there is still widespread violence and political instability. Similarly in Venezuela guerrilla forces and "mafia networks" present a significant threat to state stability. For example, Colombian guerrilla forces control the Parguaza region ("The Guerrillas Are the Police"). While they illegally expand into protected areas such as Los Gallitos, these forces purchase Venezuelan coltan at a significantly lower rate than the international trade rate ("The Guerrillas Are the Police"). However, the Venezuelan military often ignores illegal activities and protects these forces for financial participation in the schemes and has developed "'institutional' pacts with Colombian guerrilla groups" such as FARC and National Liberation Army (ELN) (SOS Orinoco).

Regional Conflict: Smuggling

Also, as more foreign investment is introduced, illegal vs. legal mining becomes harder to track. Often armed groups smuggle coltan, as well as drugs and people, across state borders. In the DRC different military groups have battled for control of the mineral deposits. Following the First Congo War Rwandan and Ugandan militias resisted departure from the DRC in favor of coltan mining. Similarly, in the 1990s when Rwandan forces controlled much of the DRC Rwanda became a leading coltan exporter despite not mining any of the mineral of themselves at the time (Van Reybrouck). The U.N. found coltan "brought in as much as $20 million a month to rebel groups" (Batware 12). As demand for coltan increased "as warlords and armies in the eastern Congo converted artisanal mining operations ... into slave labor regimes to earn hard currency to finance their militias" (Mantz 41). In 2003 journalist Klaus Werner found that multinational companies like Bayer, a German biotechnology firm, were aiding this smuggling ("Venezuela's Chavez Era"). The U.N. then linked 125 companies and individuals to breaking

"international norms" regarding consumption of the mineral including Cabot Corporation, an American chemical company ("Global minerals, arms smuggling"). These findings illuminated the role the West plays in not only complicit but active, funding of coltan related violence.

In Venezuela FARC and ELN are known for bringing coltan out of Venezuela and into Columbia through established smuggling routes, oftentimes via maritime trade routes. Within minutes illegal goods can cross national borders, quickly angering governments, militias, and workers since profits were being taken from the host sites. Additionally, coltan is often smuggled alongside drugs like cocaine and used to fund drug cartels. For example, 83 tons of Venezuelan coltan was recently confiscated from smugglers working with Mexico's Sinaloa drug cartel (Diaz-Struck et al.). Therefore, despite being owned by state companies and being a nationalized industry, the profits are not assisting in state development at the capacity it could be.

International Conflict: War

As coltan travels across countries through it causes tension between state governments and armed groups. Given the lack of clear borders in some mines and the widespread smuggling "the transnational nature of organized crime or of illegal exploitation of natural resources is another clear example of how local realities can be affected by regional and global Dynamics" (Donati et al. 15). In both the DRC and Venezuela, the coltan reserves are expansive. However, national governments, foreign developers, and militant groups are all fighting for access to the same limited resource. Therefore, "International competition for scarce resources in general, and for coltan in particular, is a key factor in the lack of state stability and the continuation of war" (Montague 104). The brutality that was funded and fueled by coltan earned it the title of "blood coltan" during the For Congo War (Meltcher et al. 1). As coltan is fought over by more parties and more states become involved in fueling mining international tensions have expanded rapidly. As China invests in coltan mines in the DRC the U.S. has become increasingly suspicious of the

ethics and have tried to compete to secure sources at a faster rate than Chinese companies, worsening competition and fueling violence (Gallagher).

Supply Chain Management and Mine Ownership

In most cases coltan mine ownership is extremely difficult to trace and complex (due to the structure of REIs and TNCs. Therefore, the flow of coltan is almost challenging to track. The mineral passes through several different levels within drastic differences in power and financial compensation.

Occasionally, mines are owned by local collectives such as groups of artisanal miners. However, more commonly the mines are owned by large international firms. Notable firms include Chinese owned China National Gold Corporation and American owned AVX Corporation. Although China has become more involved in coltan mining more recently, it is one of the most significant shareholders in coltan. Given that China is a global leader in technology development, they have invested hundreds of millions in coltan development in both the DRC and Venezuela. Given that China is not an OECD member country, it does not have to follow the OECD Environmental Impact Assessment criteria when investing in external state development. This means that Chinese developers are able to follow the highest profit margin at an environmental expense with few, if any, repercussions. Although the Chinese government has its own set of criteria for international investment, the standards are often lower than that of international regulatory bodies. Although the Chinese State Council ordered “banks to withdraw credit from companies that do not meet national industry policy and environmental standards” in 2005 this has largely encouraged the development of artisanal mining operations rather than stronger standards (Huang, Wikes). In 2021 the Chinese government invested $6 billion into Sicomines, a previously Congolese owned mining company (Huang, Wikes). Given that foreign

investors from Chinese and other companies are expanding control over the mining industry, the host countries are seeing less profits, stunting national development.

Current Legislation

Given the plethora of ethical and practical concerns over coltan mining, there have been legislative attempts to rectify the issues and implement sustainable practices. Notably, in 2010 the Dodd-Frank Act was introduced. The policy was designed to limit the consumption of conflict minerals by multinational firms like Apple and Intel among other things. However, as outlined in *"*Unintended Consequences of Sanctions for Human Rights: Conflict Minerals and Infant Mortality," this issue is not clear cut and any disruption to the current supply chain can have disastrous effects for miners. The policy had extremely adverse effects; for example, rather than raising industry standards, many mines were forcibly closed causing widespread unemployment. Workers were forced to turn elsewhere for compensation, many of which had to turn to militias for employment and protection. Following the introduction of the policy there was a drastic increase of children in the militias and the probability of infant deaths in areas surrounding coltan mines increased by roughly 143% (Parker at al. 1). Similarly can be said for the sanctions on Venezuela. The U.S. imposed sanctions in the late 2010s on political elites in an effort to curb human rights abuses, corruption, and breakdown of democracy. The U.S. then increased sanctions during the 2019 Venezuelan presidential crisis in an effort to target political illegitimacy. However, these economic sanctions were targeted at industries, including mining, which has had devastating effects on Venezuelans. As reported by The Washington Office on Latin America, instead of strengthening democracy, these sanctions have largely strengthened President Maduro's position and made citizens more reliant on the corrupt government. Both legislative attempts to curb the abuse that comes with coltan mining have had unforeseen and

devastating impacts on vulnerable communities. These “solutions” fail to target the root causes of the problems, such as lack of infrastructure and consumer demands.

Other legislation has been introduced to address the conflict mineral industry, such as the Kimberley Process Certification Scheme (KPCS), which is intended to prevent the conflict diamond industry with hopes to apply the model to other exports like coltan. The process was introduced by the U.N. General Assembly in 2003 and the KPCS claims to be “responsible for stemming 99.8% of the tide in conflict diamonds” (“WHAT IS THE KP”). However, there has been significant backlash against the KPCS. First, the scheme is heavily focused on extraction and distribution of raw diamonds, but does not include any guidance or policy regarding issues such as worker exploitation, child labor, environmental protection, or land rights. Second, the KPCS fails to track diamonds. The KPCS certifies batches of diamonds rather than individual stones which presents several problems including: conflict minerals being smuggled in batches of certified diamonds and diamonds coming from mines with unlawful control (Rhode).

There are a variety of other policies targeted to resolving ethical, safety, and environmental problems with a focus on conflict minerals and resource extraction. However, as exemplified by the ongoing conflict in the DRC and Venezuela, current policy attempts have not managed to address any of the root causes and create lasting nonviolence. However, existing policies serve as foundational models for the future and illuminate that there is no one clear policy fix.

Policy Recommendations

In order to properly respond to the urgency of coltan related conflict and build long-lasting sustainable solutions it is essential to further research and invest into alternatives. However, given that is not currently viable social, economic, or technological, to completely stop

coltan extraction it is essential to adopt a multi-pronged policy approach focused on the root causes of the conflict cycle explained above.

First the profits from coltan mining must be used for national investment and infrastructure. Currently, there is lack of reinvestment into the DRC and Venezuela despite large profits which creates a cycle of poverty. In the DRC the coltan industry is not a nationalized commodity and is controlled by private actors. By nationalizing the industry, and putting the assets under government control, it can help affirm state-control over profits and have a greater impact on state wealth. In order for this to be successful states need to have governments with a focus on national prosperity since in cases like Venezuelan coltan nationalized industry is not immune to corruption. However, there are many cases, especially in Latin America, of successful nationalization of natural resources. For example, Chile successfully nationalized their copper industry and is ranked as one of the most economically competitive countries in the world (Wickham). Chile is also one of the most stable democratic states in Latin America despite widespread regional instability. Although not perfect, the country has largely avoided conflict and the poverty cycle through strong investment in public services and infrastructure. An essential takeaway from their success is Chile's focus on working with workers and prioritizing national interest over short-term profit from international investment.

Similarly, states can improve economic stability and expand market competitiveness through diversification of industry. Oftentimes resource rich countries tend to over rely on their primary exports or natural resources. Therefore, these economies are vulnerable to instability when this resource runs out (such as it will with Coltan) or there are market crashes or price fluctuations (such as with Venezuelan oil). Export diversification has "with higher long-run growth" and uses "different dimensions including population, labor force and skills, location, levels of income, reserves, and the potential for other resource-based activities" to create more

widespread wealth and stability. This model worked well in Mexico which has a very diverse economy consisting of nationalized rail, mineral and oil exports, and agricultural goods.

Moreover, states can use waste from processing such as tailings to reduce their environmental impact and maximize the use of these finite resources ("Still Only One Earth"). Many environmental impact studies identify the tailing disposal as having the greatest negative impact associated with mining (Vick). Tailings require large storage facilities, and the waste often outnumbers the amount of mined and processed mineral ore. As the demand for minerals like coltan increases rapidly the lower quality of ore is used the greater the amount of waste is produced. Studies have found that, "The rate of tailing production over the past 50 years increased exponentially with some individual mines producing more than 200,000 tonnes of tailings per day (Jakubick et al.). However, there is significant potential for these tailings to be used more efficiently. Tin mine tailings are rich in coltan. In a study run using Spanish tin mines, they found that 7.4% of global coltan demand could be met through tailing processing (Magdelna et al.). This process and the care necessary to extract coltan from the tailings helps meet demand, maximize profit, reduce storage, and reduces pollutants like toxic waste since waste has to be handled more carefully and intentionally.

Second, there needs to be increased supply-chain transparency. Policies should have a focus on coltan tracking through the supply chain. Although complex, Canadian diamond companies have improved the ethics of their diamond extraction through a "track and trace" model. In this model each diamond is laser labeled with a unique tracking number ensuring that no illegal diamonds are being smuggled, sold, or purchased by consumers (Ali et al.)**.** Similarly, the U.N. has proposed a certification system to follow the flow of coltan through "fingerprinting" coltan to ensure only "conflict-free" coltan is being purchased. In 2006 Federal Institute for Geosciences and Natural Resources (BGR), a German firm, tested the viability of this model and

to “develop a chain of custody assurance system based on the establishment of transparent, traceable, and ethical trading chains” (“BGR”). To track the movement of coltan, each processed mineral set needs to be “fingerprinted.” BGR found that there are “identifiable regional and local variations in the composition of coltan, due to differences in mineralogical, chemical, and isotopic composition of the ore minerals,” which allows for the “distinction of locations even in districts and provinces of similar geological ages, similar host rocks or similar parent melt compositions” (“BGR”). This is significant because it means consumers can ensure they are buying coltan from their desired source rather than smuggled ores. In order to ensure this information is accessible, BGR established “Certified Trading Chains” (CTC) focused on transparency, traceability, and ethics. Primary features of the CTCs include direct relationships between producers and industrial consumers, 3rd party mine certification, and the implementation of universal standards based on OECD guidelines and Corporate Social Responsibility (CSR). In 2009, selected mines in the DCR adopted the CTC guidelines, based on the findings BGR and the Congolese Ministry of Mines are working to make the tracking more scalable and efficient.

Third, mechanisms for global accountability have to be enforced through regional alliances, intergovernmental alliances, political and economical unions, and international investment. As exemplified by how quickly coltan related conflict can expand into regions or across continental divides, it is crucial that policy is created at different levels of governance. Building regional alliances akin to OPEC for coltan will help reduce competition and encourage cooperation between groups, which will help maximize rather than concentrate wealth. Similarly, working to create these alliances will require a pause in favor of efficiency (possibly pausing some operations and restructuring others). This pause also encourages consideration of how operations affect one another and invest in long term gain. Historically there has been a pattern

of quick fixes to superficial problems that come from very deep rooted fissures and divides. For example, The International Conference on the Great Lakes Region's (ICGLR), a coalition of countries in the African Great Lakes region (including the Congo), that works to address good governance and solve regional conflicts ("International Conference"). To address the natural resource exploitation (including coltan) the ICGLR, signed the Protocol against the Illegal Exploitation of Natural Resources, which "includes implementing a mechanism for the certification of natural resources" ("International Conference"). This regional approach has helped alleviate strife between nations, notably the DRC and Rwanda, and assist in developing united solutions.

Moreover, international policy approaches can be taken through policies such as standard fairtrade pricing. Given that companies are constantly moving within a country and between countries to find cheaper costs, setting an internationally recognized standard for pricing for each step of the extraction process will reduce mining expansion and increase economic stability for extraction site countries. Similar models have been implemented for gold production. For example, the Fairtrade Foundation implemented a standard for gold in 2012 which helps artisanal miners receive fair payment, ensure safer working conditions, and assist in redistributing the profits of resource extraction between export and import countries ("Fairtrade Standard"). Additionally, since countries like China are not members of OPEC, they are able to manipulate standards and participate from different ethical frameworks, fueling international competition and therefore local and regional violence. By implementing international standards, it encourages cooperation and the legalization of standard rights such as the human right to safe working conditions.

While these policies are essential for creating a more ethical industry, they also provide a pathway to moving away from coltan extraction. Scientists are working toward establishing

alternatives such as lab grown minerals. Additionally, although there may be pushback to committing to higher pricing or concerns regarding autonomy when committing to international agreements, it is important to implement these policies. Over time social norms become legal norms and it is essential that a precedent is set that the current mining behavior is unacceptable. Although a slow process, this approach has been successful. For example, access to clean water is now an internationally recognized human right which originated as a social norm. As a whole, although these solutions may be incomplete or have unforeseen consequences, in order to move away from the cycles of conflict, it is essential to set tangible investment, transparency, and accountability.

Conclusion

When Coltan was first discovered in 1802 by Swedish Chemist Anders Gustaf Ekeberg, it was called Tantalum after the Greek myth of Tantalus ("Tantalum"). In the myth, Tantalus was the wealthy but cruel King of Sipylus. He was a close friend of the Gods, and depending on the version of the story, he committed different crimes that were eventually punished and caused him to be sent to the underworld. Some versions say that Tantalus told mortals about the secrets of the Gods, others say he served the gods his own son, Peplos, in a trick, but most famously, Tantalus is accused of stealing the food of the gods, nectar and ambrosia, from Mount Olympus and giving them to humans. Regardless of his crime, Tantalus's punishment is always the same: he is sent to the underworld and is destined to be forever thirsty and hungry while trapped between a fruit tree and a pool of water that are just out of reach. Ekberg was inspired by a tantalizing problem coltan presented: it dissolved oxides in acid. Today, the mineral still presents a tantalizing problem: it is unethical to mine and impossible not to. Like Tantalus, we are stuck between the two things we need: to extract and consume. The reference reminds us of the consequences of our actions. However, unlike Tantalus, we are not destined to stay trapped. As

the evolution of the initial connotation of the name indicated, society has changed since coltan was discovered and will continue to. It is essential that the mineral and the conflict it drives are considered with severity and complexity when developing policy solutions.

As demonstrated through coltan mining in the DRC and Venezuela, natural resource extraction, particularly of rare finite minerals, instigates and perpetuates conflict. This conflict also maintains cycles of dependence. Although coltan extraction is similar to other cases such as diamonds or oil, it presents a unique and paradoxical challenge as it is necessary for technological development. For resources like oil, although we depend on them, there are alternatives. With coltan, we not only lack alternatives, and the alternatives for other exploitative resources like wind and solar are dependent on coltan.

This dilemma presents a plethora of questions to be explored in the future. How can nations achieve development sustainably? Whose responsibility is it to ensure coltan is consumed ethically? Is it possible to balance good governance and autonomy? As companies like Meta and Apple claim they only use sustainable sourcing, which as illuminated in this study is not possible, what metrics hold them responsible? What are ways to remedy the violence and damage done by the conflict cycle in the DCR, Venezuela, and beyond?

As seen by this case study analysis and questions for the future, resource extraction is a multidimensional problem that will require specific solutions as well as a shift in social norms. Given the increasing necessity for technology as a tool to reduce global conflict, states must commit to transparent policy making and consumption, while working to establish global standards.

Given the complex relationship between export and consumer countries, the comparative case studies of the DRC and Venezuela help illuminate different layers of the resource curse, especially in context of rare resources like coltan that are necessary for tech development and the

green energy transition. Although policy will aid the transition to sustainable use of coltan, in its current iteration, coltan mining keeps society trapped in a cycle of conflict, given that the export is necessary for funding developing countries and its use is necessary in technological development. Yet, the associated conflict creates instability at every level of society. Therefore, a multi-prong policy with a focus on national investment and infrastructure development, supply-chain transparency, and global accountability is necessary.

Bibliography

Albrecht, G., Ellis, N. The Ethics of Resource Extraction and Processing: Two Western Australian Case Studies. In: Brueckner, M., Durey, A., Mayes, R., Pforr, C. (eds), 2014.

Ali, Saleem, et al. "Blockchain, Chain of Custody and Trace Elements: An Overview of Tracking and Traceability Opportunities in the Gem Industry." *The Journal of Gemmology*, vol. 36, 2018, https://doi.org/http://doi.org/10.15506/JoG.2018.36.3.212.

"Artisanal and Small-Scale Gold Mining." *OECD*, https://www.oecd.org/corporate/mne/artisanal-small-scale-miner-hub.htm.

Auty, Richard. "Mining Enclave to Economic Catalyst: Large Mineral Projects in Developing Countries." *The Brown Journal of World Affairs*, vol. 13, no. 1, 2006, pp. 135–45. *JSTOR*, http://www.jstor.org/stable/24590649.

Ayebazibwe, Patience. "International Conference on the Great Lakes Region." *Great Lakes Project*, https://www.gppac.net/files/2018-11/GLP%20Handbook.pdf.

Batware, Billy. *Resource Conflicts*.

Bavier, Joe. "Congo War-Driven Crisis Kills 45,000 a Month: Study." *Reuters*, Thomson Reuters, 22 Jan. 2008, https://www.reuters.com/article/us-congo-democratic-death-idUSL2280201220080122.

"Belgian King Establishes Congo Free State." *Belgian King Establishes Congo Free State*, https://education.nationalgeographic.org/resource/belgian-king-establishes-congo-free-state/.

"Belgian King Establishes Congo Free State." *Belgian King Establishes Congo Free State*, https://education.nationalgeographic.org/resource/belgian-king-establishes-congo-free-state/.

BGR – German Federal Agency for Geosciences and Natural ... Resolve, Apr. 2010, https://www.resolve.ngo/docs/bgr.pdf.

"Biggest Congo Coltan Miner Resumes Buying after Output Halt." *MINING.COM*, https://www.mining.com/web/biggest-congo-coltan-miner-resumes-buying-output-halt/.

Cater, Charles. "The Regionalization of Conflict and Intervention." *International Peace Academy*, 2003, https://www.ipinst.org/wp-content/uploads/publications/regionalization_of_conflict.pdf.

"Conflict Minerals Regulation." *Trade*, https://policy.trade.ec.europa.eu/development-and-sustainability/conflict-minerals-regulation_en#:~:text=In%20politically%20unstable%20areas%2C%20armed,mobile%20phones%2C%20cars%20and%20jewellery.

"Democratic Republic of the Congo." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 28 Feb. 2023, https://www.britannica.com/place/Democratic-Republic-of-the-Congo.

Díaz-Struck, Emilia, et al. "Venezuela Emerges as New Source of 'Conflict' Minerals." *ICIJ*, 13 Oct. 2017, https://www.icij.org/investigations/coltan/venezuela-emerges-new-source-conflict-minerals/.

Diaz-Struck, Emilia, and Joseph Poliszuk. "Venezuela Emerges as New Source of 'Conflict' Minerals." *Center for Public Integrity*, 28 Jan. 2019, https://publicintegrity.org/accountability/venezuela-emerges-as-new-source-of-conflict-minerals/.

"DR Congo: Army Units Aided Abusive Armed Groups." *Human Rights Watch*, 18 Oct. 2022, https://www.hrw.org/news/2022/10/18/dr-congo-army-units-aided-abusive-armed-groups.

"DR OF CONGO: UN Panel on PLUNDER OF RESOURCES." *United Nations*, United Nations, 28 Oct. 2003, https://news.un.org/en/story/2003/10/83852.

Duffy, Michael. "WHAT ON EARTH ARE THEY DOING? MINING THROUGH THE AGES, AND ITS INFLUENCE ON AMERICAN LIFE." *Journal of the Washington Academy of Sciences*, vol. 93, no. 4, 2007, pp. 21–36. *JSTOR*, http://www.jstor.org/stable/24536324.

Ebus, Bram. "Arc of Desperation." *Earth Island Journal*, 2017, https://www.earthisland.org/journal/index.php/magazine/entry/arc_of_desperation/.

Epstein, Paul "Full Cost Accounting for the Life Cycle of Coal." *Ann. N.Y. Acad. Sci*., 73-98 (2011).

"EU, UN, United Nations, Managing Land, Natural Resources, Conflict, Guide, Toolkit, Interagency Framework, Preventing Action." *United Nations*, United Nations, https://www.un.org/en/land-natural-resources-conflict/.

"Fairtrade Standard - Fairtrade International." *Fairtrade International*, Nov. 2013, https://files.fairtrade.net/standards/2015-04-15_EN_Gold-and-Precious_Metals.pdf.

"Findings on the Worst Forms of Child Labor - Venezuela." *DOL*, https://www.dol.gov/agencies/ilab/resources/reports/child-labor/venezuela.

Gelb, Alan. *Economic Diversification in Resource Rich Countries*. https://www.imf.org/external/np/seminars/eng/2010/afrfin/pdf/Gelb2.pdf.

"Global and Inclusive Agreement on Transition in the Democratic Republic of Congo (Pretoria Agreement) | UN Peacemaker." *United Nations*, United Nations, https://peacemaker.un.org/drc-agreementontransition2002.

"Global Minerals, Arms Smuggling Networks Fuel DR Congo Conflict – UN Report | UN News." *United Nations*, United Nations, https://news.un.org/en/story/2009/12/323572.

Gohlke, Julia et al., "Estimating the Global Public Health Implications of Electricity and Coal Consumption." *Env. Health Perspec*t vol. 119 821-826 (2011).

Gómez, Ignacio, et al. "Venezuela Emerges as New Source of 'Conflict' Minerals." *ICIJ*, 13 Oct. 2017, https://www.icij.org/investigations/coltan/venezuela-emerges-new-source-conflict-minerals/.

Hamilton, Richard F. "Forgotten Holocaust." *The Washington Post*, WP Company, 7 Jan. 2001, https://www.washingtonpost.com/archive/opinions/2001/01/07/forgotten-holocaust/8ca3f321-a0f6-4a76-9a18-6927f9f52435/.

Hayes, Karen, and Richard Burge. "Coltan Mining in the Democratic Republic of Congo: How Tantalum-Using Industries Can Commit to the Reconstruction of the DRC." *Flora and Fauna International*, 2003.

Hustrulid, William Andrew. "Placer Mining". *Encyclopedia Britannica*, 2 Nov. 2016, https://www.britannica.com/technology/placer-mining. Accessed 28 February 2023.'

"Indigenous Peoples' Right to Adequate Housing." *United Nations Human Settlements Programme (UN-HABITAT) Office of the High Commissioner for Human Rights (OHCHR)*, 2005,https://www.ohchr.org/sites/default/files/Documents/Publications/IndigenousPeoplesHousingen.pdf.

Jakubick, A.G., McKenna, G., & Robertson, A.G. (2003). Stabilization of tailings deposits: International experience. *Mining and the Environment III*.

"Kahuzi-Biega National Park." *UNESCO World Heritage Centre*, https://whc.unesco.org/en/list/137/.

Kiger, Patrick. “Why Venezuela Is in Crisis - History.” *How Venezuela Fell From the Richest Country in South America into Crisis*, May 2019, https://www.history.com/news/venezuela-chavez-maduro-crisis.

LALJI, NADIRA. “The Resource Curse Revised: Conflict and Coltan in the Congo.” *Harvard International Review*, vol. 29, no. 3, 2007, pp. 34–37. *JSTOR*, http://www.jstor.org/stable/43650211.

Lawson, Michele Fabiola. “The DRC Mining Industry: Child Labor and Formalization of Small-Scale Mining.” *Wilson Center*, 2021, https://www.wilsoncenter.org/blog-post/drc-mining-industry-child-labor-and-formalization-small-scale-mining.

“Lawsuit against Apple, Google, Tesla, and Others (Re Child Labour, DRC).” *Business & Human Rights Resource Centre*, 15 Dec. 2019, https://www.business-humanrights.org/en/latest-news/lawsuit-against-apple-google-tesla-and-others-re-child-labour-drc/.

Leon-Kabamba, Ngombe et al. “Respiratory health of dust-exposed Congolese coltan miners.” *International archives of occupational and environmental health* vol. 91,7 (2018): 859-864. doi:10.1007/s00420-018-1329-0

López, Estefanía, et al. “Trafficking of Coltan in the Democratic Republic of Congo.” *The Global Observatory of Transnational Criminal Networks*, vol. 4, 2017.

Lubin, J H et al. “Lung cancer in radon-exposed miners and estimation of risk from indoor exposure.” *Journal of the National Cancer Institute* vol. 87,11 (1995): 817-27. doi:10.1093/jnci/87.11.817

Magdalena, Ricardo, et al. “Simulation to Recover Niobium and Tantalum from the Tin Slags of the Old Penouta Mine: A Case Study.” *MDPI*, Multidisciplinary Digital Publishing Institute, 13 Oct. 2021, https://www.mdpi.com/2075-163X/11/10/1123.

Magdalena, Ricardo, et al. “The Energy Cost of Extracting Critical Raw Materials from Tailings: The Case of Coltan.” *Geosciences*, vol. 12, no. 5, 2022, p. 214., https://doi.org/10.3390/geosciences12050214.

Malan, Suzi, and Mark Cutifani. “How to Advance Sustainable Mining.” *International Institute for Sustainable Development*, https://www.iisd.org/articles/deep-dive/how-advance-sustainable-mining.

Mantz, J. W (2008). "Improvisational economies: Coltan production in the eastern Congo". Social Anthropology. 16 (1): 34–50. doi:10.1111/j.1469-8676.2008.00035.x.

McGinley, Patrick Charles. “Climate Change and the War On Coal: Exploring the Dark Side.” *Vermont Journal of Environmental Law*, vol. 13, no. 2, 2011, pp. 255–331. *JSTOR*, https://doi.org/10.2307/vermjenvilaw.13.2.255

Melcher, Frank et al. “Fingerprinting of conflict minerals: columbite-tantalite (“coltan”) Ores.” *SGA News*, Society for Geology Applied to Mineral Deposits, 2008, https://www.researchgate.net/publication/228401189_Fingerprinting_of_conflict_minerals_columbite-tantalite_coltan_ores.

“Mining.” *Education*, https://education.nationalgeographic.org/resource/mining.

Montague, Dena. “Stolen Goods: Coltan and Conflict in the Democratic Republic of Congo.” *SAIS Review (1989-2003)*, vol. 22, no. 1, 2002, pp. 103–18. *JSTOR*, https://www.jstor.org/stable/26996391. Accessed 25 Feb. 2023.

Moran, D., McBain, D., Kanemoto, K., Lenzen, M. and Geschke, A. (2015), Global Supply Chains of Coltan. Journal of Industrial Ecology, 19: 357-365. https://doi.org/10.1111/jiec.12206

Mustapha, A O et al. "Occupational radiation exposures of artisans mining columbite-tantalite in the eastern Democratic Republic of Congo." *Journal of radiological protection: official journal of the Society for Radiological Protection* vol. 27,2 (2007): 187-95. doi:10.1088/0952-4746/27/2/005

"Nonrenewable Resources." *Education*, https://education.nationalgeographic.org/resource/nonrenewable-resources/.

Nwaubani, Ebere. "Eisenhower, Nkrumah and the Congo Crisis." *Journal of Contemporary History*, vol. 36, no. 4, 2001, pp. 599–622. *JSTOR*, http://www.jstor.org/stable/3180775.

Nyirabihogo, Noella. "Delayed Paychecks Leave DRC Miners Scrambling for Options." *Global Press Journal*, 8 Oct. 2020, https://globalpressjournal.com/africa/democratic-republic-of-congo/months-mining-no-paychecks-leave-drc-miners-scrambling-options-including-prospect-smuggling/.

"OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas." *OECD*, vol. 3rd, 2016, https://doi.org/10.1787/9789264252479-en.

Ojewale, Oluwole. "Child Miners: The Dark Side of the DRC's Coltan Wealth." *ISS Africa*, 18 Oct. 2021, https://issafrica.org/iss-today/child-miners-the-dark-side-of-the-drcs-coltan-wealth.

Parker, Dominic P., et al. “Unintended Consequences of Sanctions for Human Rights: Conflict Minerals and Infant Mortality.” *The Journal of Law & Economics*, vol. 59, no. 4, 2016, pp. 731–74. *JSTOR*, https://www.jstor.org/stable/26457019.

Person. “Venezuela Inflation Accelerating, Heightening Risk of Return to Hyperinflation, Economists Say.” *Reuters*, Thomson Reuters, 5 Jan. 2023, https://www.reuters.com/world/americas/venezuela-inflation-accelerating-heightening-risk-return-hyperinflation-2023-01-05/.

Plumptre, Andrew, et al. “Status of Grauer’s Gorilla and Chimpanzees in Eastern Democratic ...” *Wildlife Conservation Society*, http://fscdn.wcs.org/2016/04/04/inbumeq9_Status_of_Grauers_gorilla_and_eastern_chimpanzee_Report_Final.pdf.

Polgreen, Lydia. “Congo's Riches, Looted by Renegade Troops.” *The New York Times*, The New York Times, 15 Nov. 2008, https://www.nytimes.com/2008/11/16/world/africa/16congo.html?ref=africa.

Polgreen, Lydia. “Congo's Riches, Looted by Renegade Troops.” *The New York Times*, The New York Times, 15 Nov. 2008, https://www.nytimes.com/2008/11/16/world/africa/16congo.html?ref=africa.

Prunier Gérard. *Africa's World War: Congo, the Rwandan Genocide, and the Making of a Continental Catastrophe*. Oxford University Press, 2012.

Raghavan, Sudarsan. “How a Well-Intentioned U.S. Law Left Congolese Miners Jobless.” *The Washington Post*, WP Company, 30 Nov. 2014, https://www.washingtonpost.com/world/africa/how-a-well-intentioned-us-law-left-congolese-miners-jobless/2014/11/30/14b5924e-69d3-11e4-9fb4-a622dae742a2_story.html.

Reed, D. Resource Extraction Industries in Developing Countries. *Journal of Business Ethics* 39, 199–226 (2002). https://doi.org/10.1023/A:1016538006160

Reetsch, Aneeka. *Effects of Coltan Mining on Properties and Quality of Soils of the Open-Cast Mining District Gatumba, Rwanda*, 2008, https://doi.org/https://www.researchgate.net/publication/280307759_Effects_of_Coltan_Mining_on_Properties_and_Quality_of_Soils_in_the_Open-Cast_Mining_District_Gatumba_Rwanda.

Rendon, Moises, et al. *Illegal Mining in Venezuela: Death and Devastation in the Amazonas and Orinoco Regions*. Center for Strategic and International Studies (CSIS), 2020. *JSTOR*, http://www.jstor.org/stable/resrep24248.

Reyntjens, Filip. "Regulation, Taxation and Violence: The State, Quasi-State Governance and Cross-Border Dynamics in the Great Lakes Region." *Review of African Political Economy*, vol. 41, no. 142, 2014, pp. 530–44.

Riobello, Janire. *The Dark Side of Globalization: Exploitation and Trade of Coltan in the Democratic Republic of Congo*, 13 Aug. 2019, https://sdwatch.eu/.

Roth, Clare. "How Gold Mining in Brazil Is Connected to Hundreds of Deaths – Dw – 01/26/2023." *Dw.com*, Deutsche Welle, 27 Jan. 2023, https://www.dw.com/en/brazil-how-gold-mining-is-connected-to-hundreds-of-deaths/a-64526442

Schnurr, Matthew, and Larry Swatuk. "Critical Environmental Security: Rethinking the Links between Natural ..."*Centre for Foreign Policy Studies Dalhousie University*, 2010, https://cdn.dal.ca/content/dam/dalhousie/pdf/sites/cssd/Publications/critical-environmental-security/chapter11.pdf.

SMITH, JAMES H. “Tantalus in the Digital Age: Coltan Ore, Temporal Dispossession, and ‘Movement’ in the Eastern Democratic Republic of the Congo."*American Ethnologist*, vol. 38, no. 1, 2011, pp. 17–35. *JSTOR*, http://www.jstor.org/stable/41241497. Accessed 25 Feb. 2023.

SOS Orinoco. “Coltan: The Venezuelan Regime’s Smuggling of ‘Blue Gold.’"*Saving Venezuelan Amazonia*, SOS Orinoco, https://sosorinoco.org/wp-content/uploads/2020/07/Coltan_ENG-202005.pdf.

Tamm, Henning. “The Origins of Transnational Alliances: Rulers, Rebels, and Political Survival in the Congo Wars."*International Security*, vol. 41, no. 1, 2016, pp. 147–81. *JSTOR*, http://www.jstor.org/stable/24916873.

“The Resource Curse: The Political and Economic Challenges of Natural Resource Wealth.” *Natural Resource Governance Institute*, Mar. 2015.

THIRD WAY. *Country Brief: Venezuela*. Third Way, 2019. *JSTOR*, http://www.jstor.org/stable/resrep20131.

“Transportation and Telecommunications.” *Encyclopædia Britannica*, Encyclopædia Britannica, Inc.,https://www.britannica.com/place/Democratic-Republic-of-the-Congo/Transportation-and-telecommunications.

Tsongo, Esdras. “Solange Started Working at 11, Was a Sex Slave at 15 and Had Two Kids by 17: The Brutal Truth about Your Smartphone.” *ABC News*, ABC News, 29 Feb. 2020, https://www.abc.net.au/news/2020-03-01/tech-companies-rely-child-labour-abuse-to-mine-coltan-in-congo/11855258.

The U.S. and China Are Rushing to Secure Resources in DR Congo. https://finance.yahoo.com/news/u-china-rushing-secure-resources-180000142.

"Underground Coal Mining." *Department of Environmental Protection*, https://www.dep.pa.gov/Business/Land/Mining/Pages/Underground-Coal-Mining.aspx.

United Nations High Commissioner for Refugees. "DR Congo Emergency." *UNHCR*, UNHCR, The UN Refugee Agency, https://www.unhcr.org/en-us/dr-congo-emergency.html.

van der Ploeg, Frederick. "Natural Resources: Curse or Blessing?" *Journal of Economic Literature*, vol. 49, no. 2, 2011, pp. 366–420. *JSTOR*, http://www.jstor.org/stable/23071620.

"Venezuela Situation." *United Nations High Commissioner for Refugees*, UNHCR, The UN Refugee Agency, https://www.unhcr.org/en-us/venezuela-emergency.html.

"Venezuela's Chavez Era." *Council on Foreign Relations*, Council on Foreign Relations, https://www.cfr.org/timeline/venezuelas-chavez-era.

Vick, Steven G. "Planning, Design, and Analysis of Tailings Dams." *Open Collections*, BiTech Publishers Ltd., 1 Jan. 1990, https://open.library.ubc.ca/soa/cIRcle/collections/ubccommunityandpartnerspublicati/52387/items/1.0394902.

"What Are Conflict Minerals?" *Responsible Minerals Initiative*, https://www.responsiblemineralsinitiative.org/about/faq/general-questions/what-are-conflict-minerals/.

"What Is the KP?" *KimberleyProcess*, https://www.kimberleyprocess.com/en/what-kp.

Wickham, Peter. "Copper and the Chilean Economy." *International Monetary Fund*, Apr. 1999.

Wola. "New Report Documents How U.S. Sanctions Have Directly Aggravated Venezuela's Economic Crisis." *WOLA*, 29 Oct. 2020,

https://www.wola.org/2020/10/new-report-us-sanctions-aggravated-venezuelas-economic-crisis/.

"World Report 2022: Rights Trends in Venezuela." *Human Rights Watch*, 13 Jan. 2022, https://www.hrw.org/world-report/2022/country-chapters/venezuela.

Wright, Quincy. "International Conflict and the United Nations." *World Politics*, vol. 10, no. 1, 1957, pp. 24–48. *JSTOR*, https://doi.org/10.2307/2009223.

Zava, Theodore. "Cadmium's Connection to Infertility and Reproduction." *ZRT Laboratory*, June 2018, https://www.zrtlab.com/blog/archive/cadmium-infertility-reproduction/.