2023-05-01

Conflict Minerals: 3TG Minerals and Low-Scale Violence in the Democratic Republic of Congo

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CONFLICT MINERALS: 3TG MINERALS AND LOW-SCALE VIOLENCE IN THE DEMOCRATIC REPUBLIC OF CONGO

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Dedication

To Jaymi and Francesca.

CONFLICT MINERALS: 3TG MINERALS AND LOW-SCALE VIOLENCE IN THE DEMOCRATIC REPUBLIC OF CONGO

by

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THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

Department of Political Science and Public Administration

THE UNIVERSITY OF TEXAS AT EL PASO

May 2023

Acknowledgements

I would like to acknowledge and thank Dr. Taeko Hiroi for her ever-helpful mentorship not just with this thesis, but throughout my graduate school endeavor. I would also like to thank Dr. Charles Boehmer and Dr. Bilge Firat for their guidance and support. Thank you to Alyk X. Collins, Gerardo J. Flores, Raoul Tayou Tayou, Professor Richard Gutiérrez, Dr. Carlos Algara, Dr. Cigdem V. Sirin, Dr. José D. Villalobos, as well as Lorena Chavez and Edith Duran.

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Chapter 1: Introduction

Resource curses have been extensively studied across many academic disciplines. The vast majority of these studies have mostly dealt with oil and diamonds, and how extraction and trade affect state economies, the environment, and violence. On the economy, multiple influential works exist on how a state's status as a resource rich nation can, rather than promote prosperity, lead to detrimental effects such as the Dutch Disease, bad governance, and the financial opportunities for armed groups. Regarding the latter, much research has been devoted on violence that results in death; however, most existing studies use data on violence with a more niche parameter. These studies tend to focus on large-scale violence such as civil wars and armed conflict by setting parameters to include only those incidences in which the number of deaths per event must be equal to or greater than 25 deaths.

Herein lies the problem: when research focuses on such a threshold to define a violent event, what happens to the cases in which low levels of deaths occur? And if the resulting deaths are extremely low, how does one analyze the relationship between resource curse and violence in general? Additionally, the level of effort required to extract resources can change drastically depending on the resources themselves. The type of extraction plays an important role in violence, as it then involves a wider range of actors. No longer are children and women collateral victims of violence, but their participation as mining workers places them directly in the cycle of conflict.

This thesis aims to contribute to the study of what I define as "low-scale violence" (LSV) and "high-scale violence" (HSV). Low-scale violence consists of violent events that result in 24 or less deaths per event. Alternatively, high-scale violence are the violent events that result in 25

or more deaths per event. Violent events can include battles, violence against protestors, bombings, kidnappings, and sexual violence.[1]

The purpose of this thesis is three-fold. First, this study aims to shed light on specific resources that are less often looked at when the topic of resource curse is covered in academia: tin, tungsten, tantalum, and gold, or 3TG minerals. Second, by focusing on 3TG minerals, the doors are opened for future studies as to the various effects that the extraction and trade of such minerals has on those who live in regions that are resource rich in them. Third, and the main point of this thesis, is to draw a relationship between the facileness of 3TG extraction and low-scale violence.

Extraction of 3TG minerals does not require high technology, neither does it require large investments in tools nor people. Rather, 3TG minerals employs artisanal mining, meaning that the only requirements are basic tools, or bare hands, which do not discriminate against age or gender, thereby exposing more of the population to hazardous working conditions. The low investment costs combined with an abundance of 3TG minerals incentivize groups to gain control of mines, leading them to inflict violence that puts not only these workers at risk, but those living within proximity to the mines. This aspect is further covered within the two chapters proceeding this introduction. Using the case of the Democratic Republic of Congo (DRC), I argue that areas that contain 3TG mines experience violence – including violence resulting in casualties. To be more specific, a relationship exists between living within the proximity of an active 3TG mine and higher levels of low-scale violence, as opposed to living in areas that do not have 3TG mines. Utilizing quantitative analysis, I show that indeed there is a relationship between 3TG mines, low-scale violence, and additionally, large-scale violence. These results provide a framework for further research within this topic, as well as a push towards the study of the correlation between 3TG

[1] For further explanation of violence, see the section "Violent Events" in Chapter 4.

minerals and more specific types of violence (sexual violence, child labor, violence against protestors, etc.).

The Democratic Republic of Congo serves as the prime candidate for this study. For one, it has immense deposits of 3TG minerals and provides a large portion of it for world consumers. Second, violence of various degrees exists here, and much of the violence is covered by my definition of low-scale violence. Third, the DRC provides high variation between urban and rural areas, allowing for a sub-national comparison to be made. Finally, the DRC has been shown to be under a resource curse, and therefore merits studies as to why this is so, and how it could be remedied.

Other lucrative industries exist in the Democratic Republic of Congo. According to data from the DRC's Ministry of Statistics, the country has ample investments in agriculture (coffee, bananas), manufacturing in leather and textiles, energy production through hydropower plants, and trade in natural resources (INS 2020). However, growth and investment remain modest in other industries. Particularly, foreign investment is mainly concentrated on the exploitation of minerals, with the exportation of those minerals being the driving force in the country's 8.6% economic growth in 2022 (World Bank 2023). Unlike the other industry sectors, it is minerals that continue to increase in demand and values, lending more to conflict (Kuwonu 2016).

This study takes on a multidisciplinary approach to test my hypothesis. Using crisis mapping information provided by The Armed Conflict Location & Event Data Project (ACLED), I am able to cross-reference reported fatalities with Geographic Information System (GIS) information obtained from the International Peace Information Service (IPIS) regarding verified 3TG mine locations. Furthermore, cadastral information obtained from the Trimble Land Administration (Trimble) provides further verification of active 3TG mine locations.

Chapter 1 serves as a brief introduction for my overall work. As already indicated by the previous pages, chapter 1 introduces the reader to the overall theory which this study leans on, resource curse. Here, the main definitions of low- and high-scale violence are made, and an explanation of consequent chapters is provided. The case for using the Democratic Republic of Congo as a study is made. Chapter 2 provides a literature review on resource curse. This review provides the foundation for the study of conflict resources, concentrating on petroleum (oil), economic woes, and violence, thereby setting the stage for 3TG minerals. The literature review is rounded out with an overview on attempts to curb violence resulting from resources through international policy.

Chapter 3 introduces tin, tungsten, tantalum, and gold, defining what 3TG minerals and how they are used, and their technological importance in today's society. Extraction methods for 3TG minerals are defined; a distinction is made between small-scale extraction (artisanal) and large-scale extraction. The chapter covers the effects 3TG mining have on a state's population, particularly those who are involved in the 3TG mineral trade through current literature. Lastly, chapter 3 concludes with my theory and hypothesis.

Research design is explained in Chapter 4. Chapter 4 includes key points as to justify why I have chosen to analyze the Democratic Republic of Congo along with data selection. This is particularly important because of the difficulty in obtaining verified and reliable data. Quantitative analysis of 3TG mines and violence is found in chapter 5, including operationalization of the variables, methodology, and results. Finally, this study is concluded and summarized in chapter 6, discussing the overall thesis and opportunities for further research.

Chapter 2: Natural Resources and Resource Curse – A Literature Review

This chapter offers a brief overview of resource curse theory and how it affects countries rich in resource wealth. The main purpose of this chapter is to introduce how resource curse affects countries, their governance, and the facilitation of conflict. A brief mention is also made on how oil can lead to Dutch Disease; although a few examples exist in which countries have avoided resource curse, like Norway. Beginning with oil, the first section covers how countries rich in petroleum succumb to bad governance, maldistribution of goods, and create incentive for elite groups to maintain control of resources.

Resource curse has been an extensively studied topic across numerous disciplines. A state is said to be under a "resource curse" when its economic growth is stagnant (Sachs et. al 1995) and the wealth obtained from the resources adversely affect its governance (Ross 2015).

THE OIL CURSE

A significant body of literature has examined the impact of natural resources on state economies, governance, and conflicts, commonly referred to as resource curse (Sachs et al., 1995, Mehlum et al., 2006, Ross 2015). The curse of oil, or petroleum, has been identified as a source of political and economic challenges due to the revenue it generates. Several factors contribute to these issues, including the global oil market, revenue transparency, and unequal distribution of public goods that negatively impact a state's development (Ross 2015). Oil curse can also have adverse effects by crowding out other industries. This is evident in Nigeria, where petroleum creates enclave economies and fuels violence and instability (Watts 2003). Additionally, some researchers argue that non-petroleum resources such as diamonds and coltan are also responsible for the resource curse due to their value and less complex industrial processes (diamonds, coltan).

Ross (2012) offers insight into the complex relationship between being resource rich and the challenges that come with it, particularly with oil. Countries such as Nigeria, Venezuela, and Iraq are amongst those that suffer from an oil curse, resulting in corruption, poor governance, and unequal distribution of wealth. Other countries were slow in democratization, specifically Latin American countries, like Argentina, Brazil, and Mexico. Heavy reliance on oil revenue leads these countries to experience higher levels of corruption, authoritarian rule, and weak institutions due to their reliance on oil revenues. Similar to resource curse, and sometimes used interchangeably , Dutch disease refers to a situation where a country's economy becomes overly dependent on a single natural resource, leading to a decline in the competitiveness of other industries. The discovery of natural gas in the Netherlands in the 1960s led to a surge in exports and a corresponding rise in the value of local currency, making other exports more expensive and less competitive internationally; hence "Dutch disease." Like oil curse, Dutch disease is often associated with negative economic and social consequences, such as reduced diversification, currency appreciation, and inflation (Ross 2012).

In many cases, the governments of these countries have failed to invest in other sectors of the economy, which has led to a lack of economic diversification and dependence on oil. A key argument is that ultimately it is not wealth itself, but the weak institutions that are at fault in the mismanagement and redistribution of wealth. This is a major point when comparing countries that have experienced resource curse with those that have not, for example Norway. Norway seemingly escaped a resource curse (Larsen 2006). In agreement with Ross' argument on weak institutions (2012), Larsen argues that successfully addressing those factors contributed to Norway's success. Effective government policies, investment in education and research, and a commitment to long-

term planning and cooperation between trade, labor, and government were essential in Norway's success. However, for less-developed countries, resources have led to violence.

A link exists between oil and conflict where extraction of oil contributes to sociopolitical tensions, environmental catastrophe, and as this thesis focuses on, violence (Watts 2003). Nigeria's reliance on oil revenue has led to corruption and political instability. The distribution of oil wealth has been withheld within the hands of a few elites, leading to social and economic inequality. Likewise, international actors, particularly multinational corporations, contribute to this cycle of violence and exploitation. An inability to successfully control resource deposits has led to violence. Ungovernability of oil fields contributed to the conflict in the Niger Delta, leading to the deaths of actors on both sides of the battle, comparable to the civil war of 1967 (Watts 2007).

Resource curse (in this case oil) can contribute to conflict in two ways: first, the revenue creates lucrative opportunities and desire for control of those resources; and two, the ability to maintain control and that revenue entices others to continue joining such groups, or the "winning coalitions" (Wiegand, et al., 2019). So far as winning coalitions continue to be victorious, conflict continues, even lengthening civil wars. Wiegand argues that governments and rebel groups have become heavily invested in winning control of oil resources, thus lengthening conflict.

The idea of winning elites and an increase in conflict has been argued by Ross (2004) as well. Oil not only increases the likelihood of civil war in developing countries, but also increases the likelihood of those countries becoming authoritarian regimes. These elites are able to buy off challengers, thus maintaining their status as ruling elite. Using a case study of civil wars between 1990 and 2000, Ross finds that natural resources contributed to the outbreak of civil war (the Democratic Republic of Congo) and ongoing conflict intensity (Liberia, the DRC).

RESOURCE CURSE AND DIAMONDS

As stated, a large portion of the literature on resource curse is based on oil. There are, however, studies involving other natural minerals. Diamonds have been a major issue in international studies on resources and conflict. Diamonds, like oil, are linked to conflict in similar ways. Diamonds also create an incentive for armed control of mine areas, and revenues provide funding for such armed groups, thus giving them the label of "blood diamonds." Civil conflict continues as a result of armed groups using diamonds as a source of funding (Olsson 2006). Olsson adds an additional component, the extraction process. Olsson argues that diamonds extracted by way of alluvial mining require less investment, making control of them even more tangible for those who do not have means of implementing high technological methods. Diamonds also have an added value within the international community, making them even more lucrative than other minerals. In comparison, when using a different process, kimberlite mining, those countries experienced less conflict, as was the case found for Botswana and Namibia. Blood diamonds represent up to fifteen percent of the total world diamond industry, providing major cash flow for armed groups (Orogun 2004). The resulting conflict from diamonds has large contributed to prolonged wars in African states. Just as dangerous as armed conflict, the impact results in territorial fragmentation, or "de facto balkanization" as Orogun (2004) labels it, with near institutionalized socioeconomic problems.

One of the major challenges in addressing the issue of blood diamonds is the lack of transparency in the diamond trade. Many diamonds are smuggled out of conflict zones and sold on the international market, making it difficult to trace their origin and ensure that they are conflict-free. The Kimberley Process Certification Scheme, established in 2003, was supposed to address this issue by creating a system for tracking diamonds from the mine to the market

(Grant et al., 2004, Orogun 2004). However, the effectiveness of the Kimberley Process has been called into question, as it has been criticized for being too weak and not doing enough to prevent the trade in conflict diamonds (Hughes 2006). Despite these challenges, there have been some successes in reducing the trade in conflict diamonds, and the issue remains an important area of focus for policymakers and human rights advocates.

The diamond trade that has been the focus of criticism is the role of multinational corporations in exploiting diamond resources in African countries. These corporations often prioritize profits over the well-being of local communities and have been involved in fueling conflict and human rights abuses (HRW 2018). Some companies have adopted so-called "conflict-free" policies and practices aimed at ensuring that their diamonds are not associated with armed conflict or human rights violations; this is similar to policy that will be explained in Chapter 3 regarding conflict minerals. However, the effectiveness of these policies is debatable, and there is still much work to be done to ensure that the diamond trade benefits local communities and does not contribute to conflict and instability in the region (Wexler 2009).

The literature on oil curse is extensive and provides a major key factor on resources: when rich in resources, states with weak institutions tend to succumb to conflict. Literature has shown that the opportunity to control resources leads to groups engaging in conflict. Many of these studies refer to a specific outcome: civil war. But what of conflict that does not lead to war? Particularly, conflict that does not result in deaths, but instead is riddled with sexual violence, child labor abuses, and general human rights abuses. Such is the case for a different type of resource: 3TG conflict minerals. Tin, tungsten, tantalum, and gold draw similarities to oil in that the trade of these resources has the capacity to fund armed groups. They too create asymmetry between worker and controller, where those that control the mines will engage in acts

of violence to maintain such control. The difference between these two types of sources, though, is found in the extraction process and the type of violence that is present amongst mine deposits.

Chapter 3: 3TG Conflict Minerals and Low-Scale Violence

The previous chapter explained the concept of resource curse and its relationship to violence. This chapter takes the concepts explained on oil curse and applies them to 3TG minerals. First, an introduction to 3TG minerals is made. Second, an explanation and definition of key concepts in the extraction of these minerals is set; these concepts are highly important and relative to the effects of 3TG mining. Third, I will cover the most salient effects: the funding of armed groups and sexual violence. Finally, I will state my hypothesis on the relationship between 3TG mines and low-scale violence, to be tested in Chapter 5.

ARTISANAL SMALL-SCALE MINING (ASM) VERSUS LARGE-SCALE MINING (LSM)

Tin, tungsten, tantalum, and gold make up what are known as 3TG minerals, or conflict minerals. 3TG minerals are natural minerals and "are critical resources for the electronic and automotive industries but also for other industries (aviation, medical equipment, etc.)," (Barume et al., 2016). Tin, tungsten, tantalum, and gold are primarily obtained through small scale mining, with some sourcing from recycled electronics.

Tantalum is extracted in the form of coltan, which is a metallic ore comprised of columbite and tantalite (Feick 2023). Artisanal and small-scale mining (ASM) for 3TG minerals involves several stages: prospecting, in which miners search for minerals using minimal tools (shovels, picks, etc.) to find deposits; extraction, in which minerals are then removed using those same minimal tools; processing, where minerals are separated using crude techniques (crushing the mined material, pan sifting, using pick and shovel, etc.), and finally, the refining, where the crude material is separated from the waste. At most, the use of a tractor type machine may be used, like a bulldozer (Pact 2023). Tantalum is obtained from a coltan, or "columbite tantalite." Coltan can be manually scraped from mud and washed with water in tubs to isolate and extract it (UW 2023).

Sulfuric acids are used to break apart coltan and isolate tantalum. Granted, chemicals may be used, but the process by no means needs high-tech gear.

Gold is even simpler yet can be highly dangerous. Artisanal mining for gold can require the use of mercury to bond with gold. The mercury-gold compound is then subjected to high heat, thus vaporizing mercury (exposing the worker to the toxic fumes) and isolating gold. An even simpler process for gold extraction is to sift the gold from the material by using a hand pan to manually sift for gold (EPA 2023).

While ASM is associated with individual laborers, large-scale mining, on the other hand, is associated with large companies, requires much more monetary investment, high-tech equipment, and is much more involved in world markets (Kemp et al., 2019, Rodiguez-Novoa et al., 2023). For example, the LSM process for copper is a much more extensive process. Large machinery is needed to drill for samples to be tested. Unlike the scraping and pan-sifting in ASM, LSM employs machinery to crush, and grind mined samples. Copper then requires smelting, using high energy and creating high costs, to remove impurities.

With an increasing demand for devices and technological advances, these minerals are exponentially becoming hot commodities. Some of these minerals, for example gold, can be found on almost every continent. The largest deposits, however, are found in Africa, particularly in the Democratic Republic of Congo, with an estimated 90% world production of 3TG minerals occurring here (Parker et al., 2016).

3TG minerals can be mined by two different methods: by way of artisanal low-scale mining (ASM) and industrial large-scale mining (LSM) (Stoop et al., 2019). As discussed above, LSM incurs high costs, requires advanced technology, and is usually only accessible by large transnational corporations. ASM, on the other hand, only requires physical labor, and it does not

discriminate against age, gender, or socioeconomic status. These differences between ASM and LSM have other implications. As Parker (2016) points out, due to the more cost acquired for LSM, this type of mining is left for larger corporations, which are more than likely subject to rules and regulations at the local, federal, and international level. However, ASM is quite the opposite; its small scale cannot necessarily be monitored. At base level, artisanal mining can be done using homemade tools and hands to dig, and pans and screens to sift (Stoop et al., 2019) . The ASM process can therefore involve not just corporations, but down to the individual level, where individual members of the community can be affected. Another highly important aspect, and crucial to this thesis, of 3TG minerals arises from ASM: artisanal mining creates conflict for those involved in their extraction and trade. The facileness of this extraction method becomes highly lucrative, and easy, for militia groups to capitalize on.

3TG MINERAL MINING AND VIOLENCE

ASM methods affect the health and well-being of these civilians, as the low-cost production leads to forced work recruitment (Asal et al., 2021). Extraction by hand means that even children can be forced into labor. When ASM becomes too cumbersome, workers resort to the use of homemade explosives, contributing to respiratory problems (Moyroud et al., 2002). Stoop et al.'s (2019) analysis on mines in the DRC shows that when mineral prices rise, conflict increases in areas which use ASM. Yet, the effects are not significant in LSM mines. An increase in prices creates a rapacity effect – armed groups increase their efforts to control extraction sites. This results in more conflict that includes looting. Civilian looting in areas with unregulated gold mines increased by 143% (Parker et al., 2016).

Parker et al. (2016) use spatial and temporal (territory and month) data on mines and gold prices to determine the relationship between gold, violence, and international trade policy. Their

findings not only support the theory that 3TG minerals facilitate violence, but that international policy meant to curb conflict (through the Dodd-Frank Act) actually increased the level and incidence of violence. Groups move towards corrupt activities; minerals then become akin to the drug trade, where mafia groups offer civilians protection against violence and illicit smuggling of minerals becomes another means of economic gains.

Artisanal low-scale mining provides incentives to armed groups to create violence. When prices of 3TG minerals rise, the desire for these groups to control mines increases, thus increasing violence (Stoop 2019). Furthermore, with increasing prices, an expansion in the mining sector occurs and with it an increase in fighting to control the new sectors. Stoop et al. (2019) find an additional component to the increase in violence. Not only does ASM increase the likelihood of armed groups fighting for control, when considering lootable wealth, fighting within the armed group increases as well. This results in spillover violence in which citizens are the victims. A key point made regarding this violence is that it seems to affect only ASM; large-scale mining remains relatively stable.

Hanai (2021) explains various mechanisms by which 3TG minerals and conflict are linked by way of motivation and means. For example, the “greedy rebels mechanism" refers to armed groups engaging in criminal activity to benefit from resources independent from the state government, even motivating armed groups to consider separatism. As most likely is the case with countries like the DRC, weak society-state relations and weak institutions make it difficult for the government to respond to the demands of its citizens, allowing armed groups to continue, making it easier for armed groups to continue fighting. The "feasibility mechanism" enables conflict actors to continue fighting by providing them with the financial resources to do so. The "fragmented

organizational structures mechanism" explains how resource exploitation creates organizational structures among conflict actors, increasing the cost of peace, thereby prolonging conflict.

Armed groups are also able to exploit Congolese who live near mines in several ways, including imposed systems of illegal taxation and the use of weaponized sexual violence (DeVoe 2011). Thus, as Laudati (2013) explains, conflict minerals generate an "economy of violence." In generating an economy of violence, conflict minerals not only provide a source of funding for militia groups, especially in the eastern part of the Democratic Republic of Congo but suggests that there is an additional factor. Conflict minerals change the political landscape and help rebel groups drive conflict within a mine region.

Rebel groups move past minerals and into different forms of conflict, sexual violence. Conflict related sexual violence exists within mining regions, earning the DRC the distinction of being the "rape capital of the world" (Asal et al., 2021, DeVoe 2011, Buss 2018). Not only is sexual violence a separate form of violence, but Buss states also that "conflict mining-related sexual violence" can show a link to the origins of violence within the African communities where resource extraction unfolds. The need to control mining territories is correlated with an increase in sexual violence. DeVoe (2011) furthers this topic and claims global complicity, through demand for technology, to Congo's sexual violence.

Buss' (2018) work on sexual violence is highly pertinent to this thesis by claiming that sexual violence should be in fact woven into a single narrative of conflict, with heavy critique on the lack of research into this topic. The researcher's argument is valid, as sexual violence does not necessarily meet the criteria for conflict analysis in resource conflict literature. Many researchers, especially on the topic of oil curse, rely on data that does not necessarily include sexual violence. Sexual violence can take many forms. For example, rape, sexual slavery, forced pregnancies and

marriages, and sexual exploitation. These acts, particularly rape, are used in the DRC as weapons of war (Buss 2018). Through sexual slavery, women and girls are kidnapped and forced to provide sexual favors to members of militia. These acts can have extreme consequences; forced pregnancies are an attempt at control through ethnic cleansing.

ECONOMIC DEVELOPMENT AND CONFLICT

There are many factors which can contribute to an increase in conflict within a country. Collier (2008) provides a highly influential argument on the relationship between economic development and conflict. Economic disparities, fractionalization, and weak governance play significant roles in this relationship.

As the economic gap between rich and poor increases, and the population that remains in the "bottom billion" continues to suffer from poverty, inequality, and limited access to resources, it increases frustration, resentment, and social unrest (Collier 2008). This can lead to economic and ethnic fractionalization, which results in marginalization and ethnic divisions where groups feel excluded from political power and economic opportunities. Again, as Collier argues, this creates tensions that can lead to violence through protests and demands for change. Lastly, bad governance and weak institutions both create and prolong conflict. Weak governments tend to be plagued by corruption and an absence of rule of law, thus undermining economic development, creating an environment of unrest and violence.

Without proper mechanisms for resolving disputes, addressing grievances, and ensuring equitable access to resources, conflicts can escalate and hinder progress towards sustainable development. It is therefore important that I consider economic development in my analysis. As explained in Chapter 4, I do this by addressing the ability for the Democratic Republic of Congo's government to provide water access to its population.

HYPOTHESIS FOR TESTING

The takeaway from current studies on 3TG and violence is simple: 3TG conflict minerals offer opportunity for armed groups to take in revenue using armed conflict. 3TG minerals are also simpler to extract, and therefore exploit, due to the simplicity in the mining process. Artisanal low-scale mining permits nearly everyone able to work to participate in extraction. This creates a dangerous opportunity for the infliction of violence. However, much of the literature has considered parameters in their definition of violence that could leave these victims behind. When dealing with conflict, datasets used in empirical analysis may not include victims of conflict mineral violence. For example, consider the Uppsula Conflict Data Program (UCDP). The UCDP defines violence as "violence is the use of armed force by the government of a state or by a formally organized group against civilians which results in at least 25 deaths." This definition does not fully capture the effects of 3TG mining on overall conflict, especially when including sexual violence at a level where penetrative violence might not even occur. I therefore define two types of violence: low-scale violence (LSV), where violence results in a maximum of 24 deaths, and high-scale violence (HSV), where violence results in 25 or more deaths.

Cellphones, computers, automobile parts; arguably all are major needs for a functioning society today. Their needs are greater with the sudden shift towards online education and remote working due to the COVID-19 pandemic of 2020. Even before the pandemic, society had already entered the "commodity super cycle," where between 1997 and 2010, the demand for 3TG's (and other minerals) created an increase in pricing and an increase in violence (Berman et al., 2017). Ironically, the components within the devices used to conduct this research require 3TG's. 3TG's are a hot commodity, and their use will only increase. It is important that more focus is placed on

3TG conflict minerals. Specifically, on the association between 3TG's and low-scale violence. To do this, I propose my hypothesis:

Hypothesis: The proximity of a 3TG mine in the Democratic Republic of Congo is associated with a greater number of low-scale violence fatalities for a given territory.

Chapter 4: The Subnational Data – Mines and Violence in the DRC

Researching 3TG minerals comes with a few obstacles to overcome. The simplest of these is determining what region to study. For this, the Democratic Republic of Congo serves as the epitome state for analysis. The DRC contains massive stocks of 3TG minerals and many functioning mines (Parker et al., 2016). The DRC is also, as shown in the previous chapter, subject to violence of varying degrees, including but not limited to violence resulting in fatalities. Finding other countries with 3TG mines and shared socioeconomic characteristics is difficult. However, the DRC offers variation between rural and urban areas, including distribution of mines between regions. Lastly, 3TG mining in this country is done primarily by way of artisanal and small-scale extraction methods, fitting within my theory and hypothesis on the relationship between ASM mines and fatalities. The DRC exhibits ideal conditions for testing. Herein lie the other obstacles: obtaining verified information on violent events and obtaining economic and development information from legitimate sources. To account for those, I look towards various existing databases on violence and mine locations, as well as GIS and cadastral mapping.

VIOLENT EVENTS

To measure the number of violent events, I use disaggregated data that has been collected by The Armed Conflict Location & Event Data Project (ACLED) with a range of dates between January 1, 2009, and September 30, 2022. The ACLED collects data in real-time, publishing it on a weekly basis, detailing the time, date, location, type of event, and the actors involved per event. Verification of these events was done by ACLED project researchers using geospatial coordinates for specific locations, and by triangulating reports using local and international media, vetted social media posts, and both non-government and government organizations.

The ACLED's unit of observation is an event occurring at a specific date and time. There are four types of events, each further consisting of various sub-events that elaborate on what makes up a violent event. Of high interest is that these events, unlike other fatality databases, are recorded even the act of violence results in only 1 death. In fact, these events do not necessarily require a single death to be accounted for. One can therefore set the threshold for how many fatalities constitute conflict, allowing for the parameters I have set for low-scale violence and high-scale violence to be obtainable through this data set.

Battles are defined as violent interactions between two politically organized groups where one group has the capability to harm the opposing side. One sub-event exists under battles, armed clash, where a battle occurs without a change in control of a territory.

Explosions are defined as violent events in which an attack remains asymmetrical; one group cannot respond to the other. Explosions consist of 6 sub-events: chemical weapon, when chemicals are used in the attack (but not to control crowds); air/drone strikes, when air to ground attacks are used; suicide bomb, in which suicide bombing occurs and no gunfire is present; long range weapon attacks fall under shelling/artillery/missile attack; grenades include both grenades and explosives; and remote explosive/landmine/IED is exclusive to the use of remote explosives.

Violence against civilians is strictly defined as violence inflicted upon unarmed citizens. This includes three sub-events: abductions/forced disappearances, where civilians are victims of abduction or forced disappearances; sexual violence, which consists of any harm of sexual nature even if no penetrative rape occurs; and attacks, used for any other attack on civilians that does not fall under abductions or sexual violence.

A violent protest is defined as an event in which violence is used against protestors, but protestors do not retaliate against the attackers. Protests consist of two sub-events: protests with

interventions and protests with excessive force, where the opposing group intervenes and inflicts damage on protestors.

3TG MINES

Determining the number of active artisanal 3TG mines in the DRC presents a bigger challenge. Stress is placed on the fact that a mine of this sort must be "active," as besides the obvious in which no activity means no employees, this plays an important role in gathering evidence on how many active 3TG mines the DRC has. To obtain information on 3TG mines, including how many there are, what minerals they extract, and where they are located, I utilize two sources: The International Peace Information Service (IPIS 2022) and Trimble's Mining Cadastre Portal (Trimble 2023). Trimble's project is itself a joint venture between Trimble and The Democratic Republic of Congo's Mining Cadastre , but still be referred to as "Trimble" for simplicity.

The IPIS database provides information on small-scale mining in the eastern Democratic Republic of Congo, reporting the types of minerals mined, the number of workers, and the location of mines using geographic information systems (GIS). IPIS data information is compiled using academic and journalistic publications, and confidential documents. Furthermore, the IPIS conduct fieldwork and interviews, physically visiting sites of mineral extraction. Taking advantage of GIS information, I am able to isolate mines by way of their latitudinal and longitudinal locations, thus accounting only for mines containing either tin, tungsten, tantalum, and gold (3TG). For the purpose of my analysis, a mine is considered a 3TG mine if and only if it contains a combination of gold and any of the 3T minerals. Because the IPIS map data provides information on the eastern DRC only, I then turn to cadastral information to determine the number of active 3TG mines in the rest of the country.

Trimble provides a similar GIS portal as IPIS. Trimble reports mine locations, the minerals extracted at each site along with the type of permit each mine contains. Permits are broken down into two categories, active exploration, and active exploitation. To mine, a company must apply for an exploration permit with the DRC's Mining Ministry. These types of permits are then awarded through competitive bidding and on a first-come first-serve basis. While holding an exploration permit, a company is able to perform the necessary tests to decide if the mine will be productive or not. Within one year, the application for an exploitation permit is made, and if granted, mineral extraction commences. Exploration permits are available for either mineral or quarry mines. Exploitation permits cover more types; they are available for large mines, small mines, tailings, and quarries. I use only the mines that are active and operating under exploitation permits and, like the IPIS parameters, only those that extract 3TG minerals.

SUBNATIONAL DATA

The other difficulty in researching the DRC is finding verifiable information on state demographics and economic development indicators. This problem arises because of inconsistencies and lack of transparency in reported data between various sources. Additionally, the government of the DRC underwent a provincial and territorial repartition that, introduced in 2015, increased the number of provinces from 11 to 26 (CIA 2023), making it difficult to obtain information at the sub-national (territorial) level (structure of the government's administrative divisions are explained later in this chapter). Most sources contained either aggregated sub-national data, or if the data was available, it was only accounting for populous urban areas of the DRC.

To gather provincial and territorial data, I use a more consistent source and collect information provided by annual reports published by the Democratic Republic of Congo's

Ministry of Planning - National Institute of Statistics (INS). The INS provides statistical reports on governmental structure, administration, and various socio-economic factors. Even so, the reports are highly selective and may for the most part only include information at the provincial level. The National Institute of Statistics does provide sufficient information which I then use for my control variables.

An important point is that at the time of conducting this research, the most recent report provided is the INS 2020 report. Within the 2020 report, statistical data is provided for the year range of 2016-2019. As stated, it is difficult to find consistent, and in the case of demographics, complete data. Therefore, for socioeconomic data, I use data for the year 2019, which is the year in which data for both national and sub-national data can be obtained; this is crucial for the quantitative analysis of 3TG mines and violence in the DRC. I obtain information for my control variables from the INS 2020 statistics report . This information includes the population at the provincial level, the population at the territorial level, and the percentage of the population that is connected to the public water supply.

The use of "*water connections*" as a control variable for economic development is influenced by various works on political and economic development. As already shown in the third chapter of this thesis, there is less tendency for people, particularly male youth, to join militia groups and engage in conflict when a government can successfully implement sound economic policy and redistribute public goods, giving them more economic opportunities. Moreover, by being successful in redistribution, a country can reduce economic inequality (Rostow 1959). Finding electrical energy information at the sub-national level in the DRC poses a challenge, so I turn to the percentage of households with water supply connections. For the DRC, water

connection data are available at both the territorial and provincial levels, offering an avenue to capture differences in the levels of development across the country.

An important aspect to the data remains that plays a pivotal role in my quantitative analysis, the administrative structure of the Democratic Republic of Congo. Prior to 2015, the DRC consisted of 11 provinces. Although the restructuring of 26 was introduced in 2005, it was not until the Constitution of The Democratic Republic of Congo repartitioned those 11 provinces into 25 as well as making the national capital into a distinct, 26th province (INS 2020). The new, and current, provinces are Bas-Uele, Haut-Katanga, Haut-Lomami, Haut-Uele, Ituri, Kasai-Oriental, Lualaba, Maniema, Nord-Kivu, Sud-Kivu, Tanganyika, Tshopo, Equateur, Kasai, Kasai-Central, Kongo Central, Kwango, Kwilu, Lomami, Mai-Ndombe, Mongala, Nord-Ubangi, Sankuru, Sud-Ubangi, Tshuapa, and the capital-province Kinshasa (figure 3.1).

Figure 3.1. Map of the Democratic Republic of Congo and its 26 provinces. *Source*: Image taken from the Democratic Republic of Congo's National Institute of Statistics (INS) publication, available at https://ins.cd/publications-2/.

Each province is further broken down as follows: Provinces are subdivided into territories and cities. Cities are divided into urban communities, and those communities are further divided into districts. Territories are divided into rural communities, sectors, and chiefdoms. Sectors and chiefdoms are further divided into groups, which in turn are divided into villages. In total, the

DRC contains 145 territories, 33 cities, 137 urban communities, 174 rural communities, 471 sectors, 264 chiefdoms, and 5,908 groups. Figure 3.2 shows the flowchart of this division.

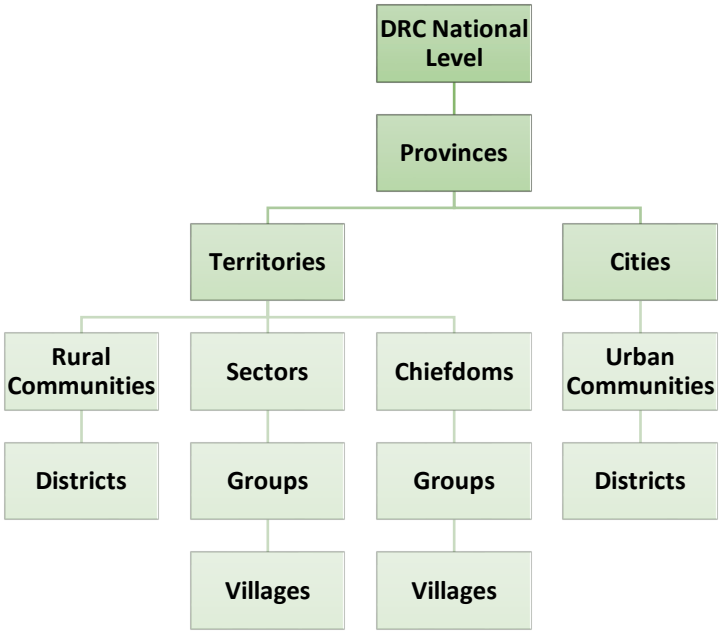

Figure 3.2. Administrative breakdown of the Democratic Republic of Congo. *Source*: Administrative structure obtained from the Democratic Republic of Congo's National Institute of Statistics (INS) publication, available at https://ins.cd/publications-2/. Figure by author.

Because of the lack of reliable data sources, no verifiable data was available for any administrative level below territories cities. For example, population numbers were not found for rural communities. Consistency between reporting sources was also lacking. The data that was obtained pertained to the provincial and territorial/city level. For comparison, these administrative levels are akin to states (provinces) and counties/cities (territories/cities) in the United States. For statistical purposes, the INS reports territories and cities as equivalent levels of administration. For this thesis, they are simply referred to as territories, and my hypothesis will test for correlation between 3TG mines and small-scale violence at the provincial and territorial levels.

Chapter 5: A Quantitative Analysis of 3TG Mines and Violence in the Democratic Republic of Congo

This chapter's focus is to test the relationship between 3TG mines and low-scale violence. Through regression analysis, I aim to determine if and how strong of a relationship there is between these two factors. Maintaining my theoretical and hypothetical framework, this analysis checks whether living in proximity to a 3TG mine, and the number of 3TG mines in that area, increases the likelihood of conflict events that result in low-scale violence. Additionally, I will check on two other relationships: whether that same presence of 3TG mines affects high-scale violence and total violence (the combination of LSV and HSV fatalities per event, per territory).

Analysis will consist of six models using two techniques, Ordinary Least Squares (OLS) and negative binomial regressions. My main dependent variable is low-scale violence. Two additional dependent variables are tested, high-scale violence and total fatalities. To measure the effects on my dependent variables, I use the independent variable total 3TG mines. To control for external effects, I use territory population and water connections.

OPERATIONALIZATION AND CONCEPTS OF VARIABLES

Dependent Variables – Low Scale and High-Scale Fatalities

Much of the literature on violence resulting from resource curse focuses on measuring conflict that results in 25 or more deaths, with other research accounting only for 1,000 or more deaths (see Chapters 2 and 3). Instead, I intend to make low-scale violence fatalities the central point of this analysis. Datasets on resource curse and conflict exist, for example, the Peace Research Institute of Oslo (PRIO). However, the dataset provided by PRIO is exclusive to battles resulting in 25 or more deaths . To overcome this obstacle, I turn to the Armed Conflict Location & Event Data Project (ACLED), which provides disaggregated event-based conflict data for

various countries around the world. The ACLED database is ideal for quantifying and operationalizing my dependent variable.

For my analysis, I use conflict data provided by the ACLED for the DRC with information on the event type, the actors involved, the location, and date of occurrence from January 2009-September 2022. I use this data for my dependent variable, low-scale violence fatalities, which is the sum of all fatalities resulting from low-scale violence that occurred in a given territory between 2009 and 2022. There was a total of LSV 29,067 fatalities, with a mean of 142.

A second dependent variable, high-scale violence fatalities, is used to measure the number of fatalities resulting from high-scale violence. High-scale violence fatalities is the sum of all fatalities from high-scale violence that occurred in a given territory between 2009 and 2022. HSV fatalities had a total of 7,165 fatalities, and a mean of 248. The maximum number of fatalities for a single territory was 1037. The justification to include and regress on HSV fatalities is to be able to determine whether previous literature is reasonable in only researching deaths 25 and above, and to compare if the relationship between 3TG mines and conflict is similar in low-scale violence and high-scale violence.

Independent Variable – Total 3TG Mines

This quantitative analysis tests the relationship between 3TG mines and conflict. Therefore, the independent variable regressed on low-scale violence is the total number of 3TG mines. Using the various mapping tools provided by Trimble and the International Peace Information Service (IPIS), mines are carefully scanned for what types of minerals those mines provide. The IPIS database provides information for mines in the eastern part of the Democratic Republic of Congo, supplying such information as geographic coordinates, whether there is a militia group(s) present, number of workers, and types of minerals (see figure 5.1 for illustrative purposes). One technique the IPIS uses is to physically visit the mines, recording each visit within

their database. To avoid counting these visits more than once, mines are determined to be one and the same using their latitudinal and longitudinal coordinates, helping eliminate duplicate counts.

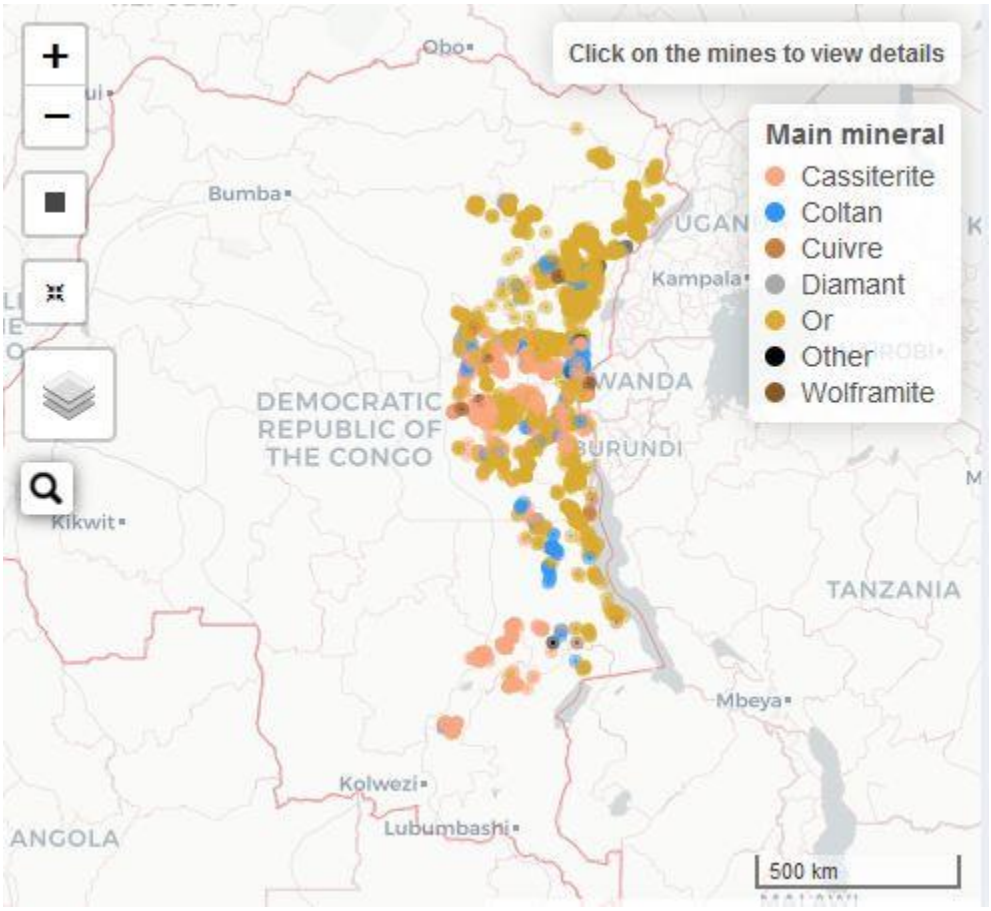

Figure 5.1. Image of the International Peace Information Service's (IPIS) artisanal small scale mining mapping system. *Source*: Screenshot taken from the IPIS website, available at https://ipisresearch.be/ (accessed May 09, 2023).

For the remaining part of the DRC (north south, west, and central), Trimble's cadastral mapping database is used. Trimble provides an interactive geographic information systems (GIS) map (see figure 5.2 for illustrative purposes). The mines mapped by Trimble provide information on the type of mining permit each mine is issued, as well as what minerals are mined. Only those mines with active extraction permits are counted.

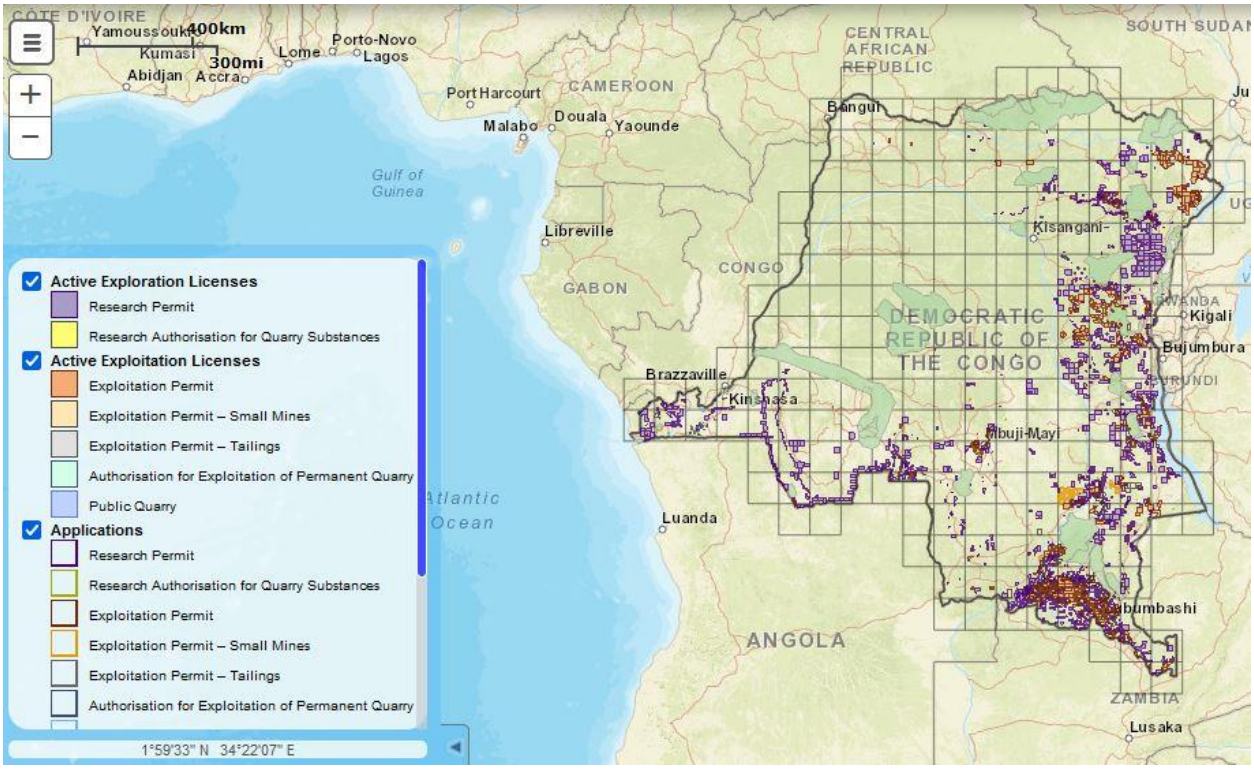

Figure 5.2. Image of the Trimble Mining Cadastre Portal (Trimble). *Source:* Screenshot taken from the Trimble website, available at http://drclicences.cami.cd/EN/ (accessed May 09, 2023).

For this thesis, "total 3TG mines" is defined as the total number of mines within a specified territory that contains 3TG minerals. To be designated a 3TG mine, the mine must include gold and at least one of the following minerals: tin, tungsten, or tantalum. Mines that do not meet this criterion are not aggregated in this measure. Moreover, these minerals must be actively extracted from the mine; mines with mineral potential but no activity are excluded from the independent variable's count. Using the criteria set forth, a total of 91 3TG mines are considered, with the lowest number of mines contained by any territory being 0, a maximum of 20, mode of 0, and mean of 0.44.

Control Variables – Territory Population and Water Connections

To account for the influence from external factors, this study includes territory population and water connections as control variables. These variables are chosen for various reasons. Both population sizes and water connections may affect the rate (or lack of) development in the DRC, which in turn can have major implications in disproportioned and mal-distributed goods and services. A large influence, as shown in Chapter 4, is that it is difficult to obtain verifiable information, particularly at the sub-national level. Second, most informational sources provide statistics at the national level. If provincial and territorial level information is found, it remains either incomplete or is only available for the time period before the DRC was repartitioned from 11 provinces to 26. I use the official publications by the Democratic Republic of Congo's Ministry of Planning - National Institute of Statistics (INS). The INS reports include information on the current socioeconomic state of the DRC. From these reports, I am able to obtain statistics at national, provincial, and territorial levels regarding population sizes and water connections. The DRC has 26 provinces with a total of 205 territories (Table 5.1).

Table 5.1. Provinces and Territories of the Democratic Republic of Congo. *Source*: Information obtained from the Democratic Republic of Congo's National Institute of Statistics (INS) publication, available at https://ins.cd/publications-2/. Table by author.

Bas-Uele	***Haut-Katanga***	***Haut-Lomani***	***Haut-Uele***	***Ituri***	***Kasai-Oriental***
Bondo	Kambove	Bukama	Dungu	Aru	Katanda
Aketi	Kipushi	Malemba	Faradje	Djugu	Lupatapata
Ango	Ville de Likasi	Kamina	Wamba	Irumu	Miabi
Bambesa	Ville de Lubumbashi	Kaniama	Watsa	Mahagi	Tshilenge
Buta	Mitwaba	Kabongo	Rungu	Mambasa	Kabeya-Kamuanga
Dingila	Pweto	Ville de Kamina	Niangara	Mongwalu	Ville de Mbuji-Mayi
Poko	Sakania		Ville d'Isiro	Ville de Bunia	
Ville de Buta	Kasenga				

Lualaba	***Maniema***	***Nord-Kivu***	***Sud-Kivu***	***Tanganyika***	***Tshopo***
Lubudi	Kabambare	Beni	Fizi	Kalemie	Bafwasende
Mutshatsha	Kailo	Lubero	Idjwi	Manono	Banalia
Kasaji	Kasongo	Masisi	Kabare	Moba	Ubundu
Dilolo	Lubutu	Walikale	Kalehe	Nyunzu	Isangi
Sandoa	Mungamba	Nyiragongo	Mwenga	Kabalo	Yangambi
Ville de Kolwezi	Pangi	Oicha	Shabunda	Kongolo	Yahuma
	Punia	Rutshuru	Uvira	Ville de Kalemie	Basoko
	Ville de Kindu	Ville de Goma	Walungu		Ville de Kisangani
		Ville de Beni	Baraka		
		Ville de Butembo	Ville de Bukavu		

Equateur	***Kasai***	***Kasai-Central***	***Kongo Central***	***Kwango***	***Kwilu***
Bikoro	Kamonia	Dibaya	Kasangulu	Feshi	Bagata
Lukolela	Luebo	Luiza	Kimvula	Kahemba	Bulungu
Bomongo	Ilebo	Kazumba	Lukula	Kasongo Lunda	Idiofa
Makanza	Mweka	Demba	Madimba	Kenge	Mangai
Basankusu	Dekese	Dimbelenge	Mbanza-Ngungu	Popokabaka	Dibaya-Lubwe
Bolomba	Ville de Tshikapa	Ville de Kananga	Moanda	Ville de Kwango	Gungu
Ingende			Seke-Banza		Masi-Manimba
Ville de Mbandaka			Songololo		Ville de Bandundu
			Tshela		Ville de Kikwit
			Ville de Matadi		
			Ville de Boma		

Lomami	***Mai-Ndombe***	***Mongala***	***Nord-Ubangi***	***Sankuru***	***Sud-Ubangi***
Kabinda	Inongo	Lisala	Mobayi-Mbongo	Lusambo	Gemena
Luilu	Kiri	Bumba	Yakoma	Lodja	Budjala
Kamiji	Oshwe	Bongandanga	Businga	Kole	Kungu
Ngandajika	Kutu	Ville de Lisala	Bosobolo	Lomela	Libenge
Lubao	Kwamouth		Ville de Gbadolite	Katako-Kombe	Ville de Gemena
Ville de Kabinda	Bolobo			Lubefu	
Ville de Mwene-Ditu	Yumbi			Ville de Lusambo	
	Mushie				
	Ville d'Inongo				

Tshuapa	***Kinshasa***	***Kinshasa***	***Kinshasa***	***Kinshasa***
Boende	Mont Ngafula	Kimbaseke	Bumbu	Kalamu
Befale	Ngaliema	N'djili	Selembao	Ngiri-Ngiri
Djolu	Gombe	Matete	Kintambo	Kasa-Vubu
Ikela	Limete	Kisenso	Bandalungwa	
Bokungu	Masina	Lemba	Lingwala	
Monkoto	Nsele	Ngaba	Kinshasa	
Ville de Boende	Maluku	Makala	Barumbu	

"Territory population" is defined as the reported census number for the total residents within said territory for the year 2019. Officially, the INS considers territories and cities as comparable levels of administration, so when using the term "territory," this study refers to both territories and cities. The lowest population for a single territory is 853 for Pangi, with the highest being 11,575,000 and pertaining to the capital of Kinshasa.

"Water connections" refers to the percentage of the population, per territory, that has a connection, or account, registered with municipal water utilities, for the year 2019. These connections are measured at the household level. This value was obtained by simply taking the ratio of the total number of connections within a territory and the total population of that territory, then reported as a percentage. The lowest percentage of the population with water connections obtained was 0.11%, a maximum of 3.12%, and a mean of 1.37%.

QUANTITATIVE ANALYSIS

This analysis uses time-series data, concentrating on the Democratic Republic of Congo as a single case unit. The DRC is the exemplar case study to test the relationship between violence and 3TG mines. Previous studies have shown that the DRC suffers from resource curse and that the residents of the DRC are also victim to various types of violence (Parker 2016). For example, sexual violence, violence against children, forced child labor, and attacks from militia groups (Rustad et al., 2016). The findings for this study can therefore be used to compare countries of similar social and political characteristics that contain 3TG minerals.

Analysis will be done by using two techniques, Ordinary Least Squares (OLS) and negative binomial regressions. Although the main concern of this thesis is to test the relationship between 3TG mines and low-scale violence fatalities, I also analyze the relationship between 3TG mines and two additional dependent variables, high-scale violence fatalities, and total fatalities (LSV and HSV fatalities combined). To measure the effects on my dependent variables, I use the

independent variable "total 3TG mines." To control for external effects, I use "territory population" and "water connections."

Results and Discussion

The results for my main model pertaining to low-scale violence are summarized in Table 5.2.

Table 5.2 OLS and Negative Binomial Regression Results for 3TG Mines on the Number of Fatalities from Low-Scale Violence, 2009-2020.

	Low-scale Violence (logged) (OLS)	**Low-scale Violence (logged) (negative binomial regression)**
3TG Mines (logged)	1.25**	0.34**
	(0.28)	(0.09)
Population (logged)	0.18**	0.10**
	(0.04)	(0.01)
Water Connections	0.10	0.02
	(0.34)	(0.13)

Notes: Entries are coefficients. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$. N = 205. R^2 = 0.18, pseudo R^2 = 0.05. Entry clustered by province. *Source*: Author.

When regressing (OLS) 3TG mines on fatalities from low-scale violence fatalities, the results are statistically significant. There exists a positive relationship between both variables in which when the number of 3TG mines increases by 1 unit, the resulting LSV fatalities per event in that territory increase by approximately 4. Likewise, when running a negative binomial regression, the results are statistically significant (although slight), and a positive relationship exists.

The results for the relationship between high-scale violence and 3TG mines are summarized in Table 5.3.

Table 5.3. OLS and Negative Binomial Regression Results for 3TG Mines on the Number of Fatalities from High-Scale Violence, 2009-2020.

	Large-scale Violence (logged) (OLS)	Large-scale Violence (logged) (negative binomial regression)
3TG Mines (logged)	1.26**	0.80**
	(0.36)	(0.19)
Population (logged)	0.09*	0.13**
	(0.04)	(0.04)
Water Connections	0.18	0.14
	(0.22)	(0.31)

Notes: Entries are coefficients. Robust standard errors are in parentheses. * $p < 0.05$, ** $p < 0.01$. N = 205. R^2 = 0.13, pseudo R^2 = 0.02. Entry clustered by province. *Source*: Author.

Similar results are obtained when testing the independent variable on high-scale violence fatalities. For both OLS and negative binomial regressions, the relationship between 3TG mines and HSV fatalities is positive and statistically significant. For every unit increase in 3TG mines, large-scale violence fatalities increases by 4.

The third and final set of regressions, Table 5.4, summarizes the results when testing total fatalities and 3TG mines.

Table 5.4 OLS and Negative Binomial Regression Results for 3TG Mines on the Number of Fatalities from Total Fatalities, 2009-2020.

	Total Fatalities (logged) (OLS)	Total Fatalities (logged) (negative binomial regression)
3TG Mines (logged)	1.31**	0.35**
	(0.28)	(0.09)
Population (logged)	0.20**	0.10**
	(0.04)	(0.01)
Water Connections	0.14	0.03
	(0.35)	(0.13)

Notes: Entries are coefficients. Robust standard errors are in parentheses. . * p < 0.05, ** p < 0.01. N = 205. R^2 = 0.18, pseudo R^2 = 0.05. Entry clustered by province. *Source*: Author.

The regressions for total fatalities follow the previous ones in which the relationship between dependent and independent variables are positive and statistically significant.

The results indicate support for my hypothesis. There is correlation between 3TG mines and low-scale violence fatalities. Living in proximity to a 3TG mine lends to the higher likelihood of an increase in LSV fatalities. The supplemental regressions also suggest that 3TG mines increase the likelihood of high-scale violence fatalities as well. This is in accord with the qualitative literature on varying degrees of violence and specific 3TG minerals, like gold. Population was found to be statistically significant as well, but that may be attributed to the fact that with higher populations comes a higher number of potential victims, or at the other end, a larger pool of potential militia participants (Collier 2007).

Chapter 6: Conclusion

Countries that succumb to a resource curse, for the most part, experience detrimental socioeconomic effects. Although some countries have been able to escape the resource curse, at least momentarily, most suffer from increased conflict, mal-distribution, reliance on a stagnant or crumbling economy, much of which is attributed to weakening government institutions. This thesis has argued that those who live in proximity to 3TG mines are subject to violence from militia groups which have been financed through the exploitation of labor and the trade of resources. In the case of the Democratic Republic of Congo, the resource examined within study pertains to gold, tin, tungsten, and tantalum (3TG). Much less studied than other resources, specifically oil and diamonds, I hope to contribute to the developing research into 3TG conflict minerals. This work has been successful in showing that there exists correlation between the presence and proximity of 3TG mines and conflict.

Extraction of 3TG mines in the DRC is by way of artisanal small-scale mining (ASM). As opposed to large-scale mining, ASM extraction methods are low-cost, simple, and may be worked by anyone, regardless of age, that can excavate and search for minerals without the need of expensive or technical equipment. This attracts a large number of people to work in the mines. The low "overhead" costs in turn create a more lucrative incentive for armed groups to control mineral deposits and harm those who work there. It is here where the importance of this thesis emerges. Much of the previous literature has concentrated on conflict in which as a result of violent events, a large portion of those attacked experienced fatal results in higher numbers. By doing so, it leaves the low levels of deaths unaccounted for. The implication of excluding low-scale violence is that the population that experiences low numbers of deaths, for example through

sexual violence, child labor exploitation, and general physical harm, are also excluded from consideration in implementation of protective measures.

This thesis has set forth definitions for two key issues in resource conflict, low-scale violence (LSV) and high-scale violence (HSV). By doing so, this study is able to consider violent events that would otherwise not be considered in other studies. More importantly, the ability to account for those that are victims of violence and who would otherwise not fit into statistical studies.

The key argument was that there is a relationship between 3TG mines and violence; in which 3TG mines increase the number of, and therefore the severity, of low-scale violence. Using OLS and negative binomial regressions, and accounting for external state developmental factors, the results showed support for my hypothesis. When dealing with a political regime like that in power in the DRC, obtaining data for those outside factors posed some difficulty.

In Chapter 1, I have outlined why this work is important and how the study was conducted throughout this thesis. The case for using the DRC for this study was made; the combination of large 3TG deposits, the rampant violence, the presence of militia groups, and the amount of 3TG minerals that are exported out of this country make the DRC the prime candidate for study. Much of the literature on resource curse covers the African continent, but mainly on oil curse.

Chapter 2 consisted of an explanation of the underlying theory that inspired this thesis. Oil curse, and Dutch Disease, facilitate conflict through the weakening of social and political institutions. Likewise, the incentive for control of resources and revenues increase the probability of various actors to engage in conflict. Included in this chapter was a brief overview of diamonds, a mineral similar to 3TG in its world value and extraction methods. Akin to oil and diamonds,

3TG minerals flash opportunity to militia groups to gain control, albeit at different levels of conflict.

Chapter 3 explained the differences in the extractive process of 3TG minerals and why these processes are important. A comparison between artisanal low-scale mining and large-scale mining was made. 3TG minerals are mined via low-scale mining, and this chapter explained how low-scale mining creates lucrative opportunities for armed groups to gain control of mines. Mainly, through acts of violence involving low-scale conflict (physical attacks, attacks on protestors, bombings, aerial attacks, sexual violence). In this chapter, my hypothesis was stated, in which living in proximity to 3TG mines means that the likelihood of experiencing low-scale violence increases.

Because this thesis included quantitative analysis, studying the Democratic Republic of Congo posed a major challenge. Data was difficult to come by due to the inconsistency and the lack of credibility of many sources. Chapter 4 is dedicated to explaining such difficulties and how I was able to remedy them. This was done by building a dataset provided and only including events that met my definitions of fatalities from low-scale and high-scale violence using data provided by the ACLED. For mining information, the use of GIS portals provided access to maps and verify working mines. For statistical purposes, I relied on the official reports provided by the DRC's Ministry of Statistics.

Quantitative analysis was covered in Chapter 5. An explanation of my concepts and variables is found here. Regressions were made on three variables: my main dependent variable of LSV fatalities, a second dependent variable of HSV fatalities, and a third dependent variable of total fatalities. Results supported my hypothesis. Regression analysis results indicated there is a positively correlated relationship. As the number of 3TG mines increases, so does the number of

LSV fatalities. When testing for correlation between 3TG mines and HSV fatalities, again, analysis showed that both variables are positively related; the more 3TG mines, the more fatalities. The number of mines also affects total fatalities overall. The implication of the extraction of conflict minerals is that there is an increased chance for violence. Especially when dealing with a state with bad governance, as is the case with the DRC.

The findings of this study provide an incentive for further research. One of the most important questions that arises is, if the presence of 3TG minerals can pose a threat to the local population, how can this be either avoided or rectified? More so, knowing that conflict minerals lend to such violence, can an a posteriori approach be taken when dealing with new mines opening? For example, can regulations likened to the Kimberley process be implemented before mines become operable. And can governments, rather than NGO's, enforce such regulations.

Studies have shown that current policy has failed to address conflict in the Democratic Republic of Congo (Seay 2012). Seay actually finds that such a policy is rather detrimental to local workers. Further research is therefore required to determine ways in which policy may be created and implemented in such a way to maintain mine productivity yet avoid low-scale violence. Policy that takes into account world consumption and trade as well, as the Dodd-Frank Act has attempted. There is still much to do and research on preventive policy when it comes to conflict minerals, something that hopefully this study urges researchers to undertake.

It remains pertinent to continue research on fatalities from low-scale and high-scale violence. Using the gathered data and applying similar methods, the focus can shift to specific types of LSV. Especially on sexual violence, as it remains an ever-important issue, yet trailing in available literature when compared to violence as collateral damage from acts of war. A combination of qualitative and quantitative research on 3TG minerals and sexual violence is highly

crucial. When considering the abilities and skill required for artisanal mining, women are just as qualified to join the workforce as men, yet the risks of being victims of this type of violence are much higher. As women emerge from traditional homemaker roles and participate in a household's income potential, there must be a guarantee that regardless of the type of labor, in this case ASM, women may do so safely.

It is no novel theory that workers' rights suffer under bad governance and that authoritarian regimes play a pivotal role in suppressing labor rights and those who protest against this treatment. Included in the definition of low-scale violence is violence against protestors, events in which protestors do not have the capacity to retaliate. Again, it is a situation in which LSV can be applied and further studied, concentrating solely on working class rights.

I have shown how 3TG mines affect violence in the Democratic Republic of Congo. The reason for choosing the DRC is because of the number of 3TG mines and the heavy reliance of the country's economy on its resources. For future work, a comparative analysis can be made between the DRC and other countries. For example, 3TG minerals are found in various other African states, but these minerals are also found in other parts of the world as well. Canada and Argentina contain tin, while gold is found in all but one continent. Yet, LSV is not statistically present in Canada nor Argentina.

The results obtained in this thesis are of high interest to the study of conflict minerals and resource curses. These results are not finite; hopefully these results are quite the opposite and provide an opportunity for further research. With an ever-increasing demand for technology comes an ever-increasing demand for 3TG minerals. The exploitation of these minerals has been shown to relate to an increase in violence for those cursed to be rich in them. Rather, the people

in and around the mine are exploited as well. It leaves much responsibility on governments, manufacturers, and consumers to remedy this.

References

Asal, V., Nagel R. U. (2021) Control Over Bodies and Territories: Insurgent Territorial Control and Sexual Violence, Security Studies, 30:1, 136-158, DOI: 10.1080/09636412.2021.1885726

Barume, B., Naeher, U., Ruppen, D., & Schütte, P. (2016). Conflict minerals (3TG): Mining Production, Applications and Recycling. Current Opinion in Green and Sustainable Chemistry, 1, 8-12.

Berman, N., Couttenier, M., Rohner, D., Thoenig, M. (2017). This Mine is Mine! How Minerals Fuel Conflicts in Africa. American Economic Review, 107(6), 1564-1610. doi:10.1257/aer.20150774

Buss, D. (2018). Conflict Minerals and Sexual Violence in Central Africa: Troubling Research, Social Politics: International Studies in Gender, State & Society, Volume 25, Issue 4, Winter 2018, Pages 545–567, https://doi.org/10.1093/sp/jxy034

Central Intelligence Agency (CIA) (2023). Democratic Republic of Congo. https://www.cia.gov/the-world-factbook/countries/congo-democratic-republic-of-the/ accessed January 30, 2023.

Collier, P. (2008). The bottom billion: Why the Poorest Countries are Failing and What Can Be Done About It. Oxford University Press, USA.

DeVoe, A. (2011). Carrying Piece of Congo In Our Pockets: Global Complicity to Congo's Sexual Violence and the Conflict Minerals Trade. Seattle Journal for Social Justice, 10(1), 463-508.

Grant, J.A., Taylor, I. (2004). Global Governance and Conflict Diamonds: the Kimberley Process and The Quest for Clean Gems, The Round Table, 93:375, 385-401, DOI: 10.1080/0035853042000249979

Hanai, K. (2021). Conflict Minerals Regulation and Mechanism Changes in the DR Congo. Resources Policy, 74, 102394.

Hughes, T. (2006). Conflict Diamonds and the Kimberley Process: Mission Accomplished—or Mission Impossible? South African Journal of International Affairs, 13(2), 115-130.

Human Rights Watch (HRW). (2018). Diamond Trade Still Fuels Human Suffering. Retrieved from https://www.hrw.org/news/2018/05/10/diamond-trade-still-fuels-human-suffering. Accessed December 1, 2022.

Kemp, D., Owen, J.R. (2019). Characterising the Interface Between Large and Small-Scale Mining, The Extractive Industries and Society, 6(4), Pages 1091-1100, https://doi.org/10.1016/j.exis.2019.07.002

Kuwonu, F. (2016). DRC Economy: The Giant Awakens. United Nations. https://www.un.org/africarenewal/magazine/august-2016/drc-economy-giant-awakens.

Laudati, A. (2013). Beyond Minerals: Broadening 'Economies of Violence' in Eastern Democratic Republic of Congo, Review of African Political Economy, 40:135, 32-50, doi: 10.1080/03056244.2012.760446

McClelland, D.C. (1985). The Achievement Motive in Economic Growth, Development and Underdevelopment The Political Economy of Global Inequality 2014, 5, pp 239-255.

Mehlum, H., Moene, K., Torvik, R. (2006). Institutions and the Resource Curse, The Economic Journal, Volume 116, Issue 508, Pages 1–20, https://doi.org/10.1111/j.1468-

0297.2006.01045.x

Moyroud, C., Katunga, J. (2002). Coltan Exploration in Eastern Democratic Republic of Congo. Scarcity and Surfeit: The Ecology of Africa's Conflicts. Pretoria: Institute for Security Studies, 157-185.

Olsson, O. (2006). Diamonds are a Rebel's Best Friend. The World Economy. Volume 28, Issue 8, Pages 1133-1150, https://doi.org/10.1111/j.1467-9701.2006.00809.x

Orogun, P. (2004). "Blood Diamonds" and Africa's Armed Conflicts in the Post-Cold War Era. World Affairs, 166(3), 151-162.

Parker, D. P., Vadheim, B. (2016). Resource Cursed or Policy Cursed? US regulation of Conflict Minerals and Violence in the Congo. Journal of the Association of Environmental and Resource Economists, 4(1), 1–49. https://doi.org/10.1086/689865

Peace Research Institute (PRIO). https://www.prio.org/, accessed April, 2023.

Rodriguez-Novoa, F., Holley, E. (2023). Coexistence between large-scale mining (LSM) and artisanal and small-scale mining (ASM) in Peru and Colombia, Resources Policy, Volume 80, January 2023.

Ross, M. L. (2012). The Oil Curse: How Petroleum Wealth Shapes the Development of Nations. Princeton University Press.

Ross, M. L. (2015). "What Have We Learned about the Resource Curse?" Annual Review of Political Science, 2015, 18(1): 239-259.

Rostow, W. W. (1959). The Stages of Economic Growth. The Economic History Review, 12(1), 1–16. https://doi.org/10.2307/2591077

fSachs, J. D. Warner, A. M. (1995). Natural Resource Abundance and Economic Growth. NBER Working Paper No. 5398, doi:10.3386/w5398

Saunders, R. (2014) Geologies of Power: Blood Diamonds, Security Politics and Zimbabwe's Troubled Transition, Journal of Contemporary African Studies, 32:3, 378-394. doi:10.1080/02589001.2014.956501

Stoop, N., Verpoorten, M., van der Windt, P. (2019). Artisanal or industrial conflict minerals? Evidence from Eastern Congo, World Development, Volume 122, 2019, Pages 660-674, ISSN 0305-750X, https://doi.org/10.1016/j.worlddev.2019.06.025

UCDP. Uppsala Conflict Data Program. Department of Peace and Conflict Research. https://ucdp.uu.se/

Watts, M. (2003). Economies of Violence: More Oil, More Blood. Economic and Political Weekly, 38(48), 5089–5099. http://www.jstor.org/stable/4414347

Watts, M. (2004). Resource Curse? Governmentality, Oil and Power in the Niger Delta, Nigeria, Geopolitics, 9:1, 50-80, doi: 10.1080/14650040412331307832

Wiegand, K., Keels, E. (2019). Oil Wealth, Winning Coalitions, and Duration of Civil Wars. Journal of Conflict Resolution. 63(4):1077-1105. doi:10.1177/0022002718766414

Williams, P. (2016). War & Conflict in Africa (2nd ed.). Polity.

World Bank (2023). World Bank in DRC, https://www.worldbank.org/en/country/drc/overview

Vita

Proudly originating from Ciudad Juárez, Chihuahua, México, Jesus Tlaloc Maldonado has spent the majority of his life calling the U.S.-México borderland region his home. Having lived in the U.S. under undocumented status, pursuit of a higher education was always a dream. After graduating from El Paso High School, Jesus spent years working in labor jobs. When Jesus finally obtained documented status, one of the first things he did was enroll in college. Jesus has varied interest and thus has taken a multidisciplinary approach to his studies, first obtaining an Associate's of Science – Natural Science from the University of Hawai'i Maui College (2017), followed by a Bachelor's of Science in Chemistry from the University of Texas at El Paso (UTEP, 2019), and a Master of Arts in Political Science from UTEP (2023). Highly passionate about his heritage, Jesus aims to apply his multidisciplinary knowledge to support and uplift his community: Méxicanas/os, Latinas/os, and Chicanas/os, as well as other marginalized, under-represented groups.

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