Much of the global supply of cobalt, a vital mineral within lithium-ion batteries used in most electronic devices is mined in the Democratic Republic of Congo (DRC). With growing demand for lithium-ion batteries, the demand for cobalt is expected to skyrocket. This is problematic because the working conditions of hundreds of thousands of Congolese who mine for this mineral are put at risk. This is not to say that cobalt should not be mined, but the government does not have the good governance principles or the capacity to regulate and enforce the artisanal mining. Instead, major technology companies should wield their power to create better labor conditions for this essential mineral. Apple, with its uniquely powerful brand, should step into a leadership role to transform the supply chain.

I. Exploitative Labor in the DRC

The DRC is a landlocked country in central Africa with a history of conflict and exploitation. After gaining independence in 1960, the country has been trapped in poverty and a civil war that has engulfed the region. The DRC economy has been historically based on the “exploitation of mineral resources”\(^1\); however, most of the capital accumulation after the collapse of Gécamines, the state mining company, has not benefited the country.

The DRC possesses an immense diversity of minerals, including cobalt, copper, petroleum, and uranium.\(^2\) Despite the potential to use these resources as an economic engine, militia and foreign armies have smuggled them into the international market – over $400 million in diamonds and gold.\(^3\) Historically, the Katanga province is considered the most important mining area due to its cobalt reserves\(^4\), with the heaviest mining in the southern copper belt, stretching from Zambia to Angola.

Over the last decade, international attention has focused on how the sale of conflict minerals—gold, tantalum, tin and tungsten—has fueled armed groups and ongoing violence. However, there has been no evidence to indicate cobalt revenues impacted the civil war financially.\(^5\) Without classification as

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1 Mazalto, Governance, Human Rights and Mining, pg 188
3 Kaplan, The Wrong Prescription for the Congo
4 Perks, How Can Public Private Partnership
5 Chan-Fishel, Environmental Impact, pg 150
a conflict mineral, companies do not have the same requirements under DRC or US law to track the source of the extraction of cobalt.

**Cobalt**

Cobalt\(^6\) is the most expensive mineral needed for rechargeable lithium-ion batteries, and the DRC is described as “the most important source”\(^7\) with 50\(^8\) to 60\(^9\) percent of the world’s reserves. In 2015, it’s estimated that 67,735 metric tons were mined in DRC.\(^10\) During the same year, the price fluctuated from $20,000 to $26,000 per ton of refined cobalt sold.\(^11\) Using the low price estimate, this translates to at least $1,354,700,000 in cobalt sales.

Silicon Valley’s innovation is dependent on lithium-ion batteries.\(^12\) These batteries are seen as the ‘green’ option – they are lighter and contain more energy than lead-acid batteries.\(^13\) For context, a smartphone battery may contain five to ten grams of refined cobalt, while 15,000 grams are used in an electric-car battery.\(^14\) Tech gadgets would not be as light and compact without these cobalt-rich batteries.

**The Rise of Artisanal Miners**

The rise and fall of Gécamines, drove the increase in artisanal mining. After success in the 1970s and 1980s, the company struggled in the 1990s from mismanagement and corruption, and revival seemed unlikely. President Mobuto Sese Seko’s regime collapsed and the DRC experienced a second war. With President Kabila’s encouragement, individuals began digging by hand on the Gécamines land.\(^15\)

The term “artisanal miners” – or diggers – describes the impoverished workers who mine without the use of drills or draglines.”\(^16\) They use mallets, chisels and head torches without appropriate safety gear. This mining happens often outside of regulated mines – diggers describe ‘labyrinths of underground

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\(^6\) Note that Cobalt is separate from coltan (or tantalum), which is a designated conflict mineral. Both cobalt and coltan/tantalum are important components for digital technology.

\(^7\) Cited from Amnesty International’s This Is What We Die For report, although the The Washington Post’s Cobalt Pipeline made a similar claim about its importance to the world’s cobalt supply.

\(^8\) Mazalto. Governance, Human Rights and Mining, pg187

\(^9\) Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*

\(^10\) Wilson, *Tech Giants Accused*

\(^11\) Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*

\(^12\) Ibid

\(^13\) Ibid

\(^14\) Ibid

\(^15\) Ibid

\(^16\) Ibid
caves,” tunnels through dirt floors of homes, and mines from pit shafts. In eastern Congo, mining for mineral resources remains the only opportunity for hundreds of thousands of people.

The number of artisanal miners in the Congo today is disputed, ranging from 100,000-2,000,000 people. Diggers produce cobalt ore that is cheaper and contains higher percentages of the mineral than industrialized mines. Given the availability of cheap cobalt in the global market, some international traders replace contracts for industrial ores with artisanal ones. This is problematic because of the common human rights violations and appalling working conditions connected with artisanal practices.

**DRC’s Mining Code**

The 2002 Mining Code defines artisanal mining as “any activity by means of which a person of Congolese nationality carries out extraction and concentration of mineral substances using artisanal tools, methods and processes, within an artisanal exploitation area.” It provides stipulations for who, where and how mining activities can be done. For instance, artisanal mining should only occur in “authorized Zones d’exploitation asrtianale (ZEAs) where “industrial or semi-industrial mining is not viable.” However, the government failed to create enough ZEAs, so many have turned to mining in unauthorized zones. Some miners trespass on property of industrial mining companies to access mineral reserves, which has incited violent clashes between diggers, industrial mine companies and police.

The government body regulating the sector, Small-Scale Mining Technical Assistance and Training Service (SAESSCAM), has been repeatedly critiqued for its inability to enforce the Code. They hope to create more ZEAs but are limited by resources and capacity. Right now, there are only 32 ZEAs in the southern mining belt; of these, six existed prior to 2014 and it’s unknown how many created between 2014 and 2015 are operational.

**Exploitative Labor Practices**

The law in the DRC does not criminalize forced labor, although its Constitution does prohibit indentured servitude. The 2016 TIP Report acknowledges that individuals working in the artisanal

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17 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
18 Amnesty International, *This Is What We Die For*, pg 24
19 Geenen, *A Dangerous Bet*
20 Perks, *Towards a Post-Conflict Transition*, pg 181
21 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
22 DRC Mining Code
23 Wilson, *Tech Giants Accused*
24 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
25 Ibid.
26 State Department, *TIP Report*, pg 137
mines are “subjected to forced labor, including debt bondage, by mining bosses, other miners, family members, government officials, and armed groups.”

Miners frequently spend 12-24 hours underground. Mines are built haphazardly, rarely following the limited guidelines for safe construction. For example, tunnels should not be deeper than 30 meters or have an incline of less than 15 degrees. However, researchers found that many mines do not comply with these regulations. One miner explained that generators are sometimes necessary to pump oxygen into deep mine shafts.

Child labor is known to be part of the supply chain for cobalt. Some mine underground, while others collect pieces left in the water during washing.

In 2012, UNICEF estimated 40,000 children were involved in Congo’s mining industry. Children’s work in mines is a significant violation of the DRC law, both of the Mining Code and of the Labour Code. It also violates the International Labour Organization’s (ILO) Worst Forms of Child Labour Convention, which includes any work underground or that involves exposure to dangerous substances.

Long hours in the mines with ongoing exposure to cobalt without proper protective gear has numerous health consequences. When working with cobalt, the Centers for Disease Control advises using “respirators, impervious clothing, gloves and face shields.” Because most miners do not, they are exposed to metals far beyond safe levels. Despite safety guidance that recommends a well-ventilated space, the ventilation in underground mines is often lacking. Individuals working in and around the mines suffer from a variety of respiratory illnesses. For women, continued radioactive exposure is linked to high rates of stillbirths, miscarriages and birth defects. This exposure is particularly dangerous for children working or living near a mining site; an ILO study found dangerous metal levels in the bodies of children, far beyond occupational limits.

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27 State Department, TIP Report 2016, p. 137
28 Amnesty International, *This Is What We Die For*, pg 22
29 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
30 Both Amnesty International researchers and Washington Post journalists reporting lack of compliance with safety requirements at the mines.
31 Amnesty International, *This Is What We Die For*, pg 28
32 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
33 This statistic is not specific to cobalt extraction.
34 Amnesty International, *This Is What We Die For*, pg 37
35 Amnesty International, *This Is What We Die For*, pg 28
36 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
37 Amnesty International, *This Is What We Die For*, pg 21
38 Center for Disease Control, *Cobalt*
39 Perks, Towards a Post-Conflict Transition, pg. 188. Further, the rates of stillbirths, miscarriages and birth defects have been reported by SAESSCAM and the Paraclisis Research Group at the University of Lumbumbashi.
40 Amnesty International, *This Is What We Die For*, pg. 29
Diggers are paid based on how much mineral is collected, which amounts to approximately US $2-3 on a productive day.\textsuperscript{42} When miners sell their cobalt to the registered shops, the mineral content is tested by a radar-like gun. The machines may be rigged, but miners have no way to independently verify.\textsuperscript{43} For many, artisanal mining is “the only secure income-earning endeavor” they can participate in.\textsuperscript{44}

Fatal accidents happen frequently but are rarely reported.\textsuperscript{45} In recent years, miners have died in underground fires,\textsuperscript{46} landslides, and collapsed tunnels.\textsuperscript{47} Between September 2014 and December 2015, at least 80 miners died during underground accidents.\textsuperscript{48} One digger explained, “the risk of a cave-in is constant.”\textsuperscript{49}

II. The Global Supply Chain for Cobalt

Cobalt mining is an important source of wealth for Congolese citizens and the government, but increased attention to and regulation of the supply chain is urgently needed. First, this section will examine existing legislation and international standards intended to secure a clean supply chain. Then, it will look at how the supply chain for cobalt works, including familiar brands at the end of the supply chain.

Due Diligence, Legislation & International Standards

Currently, no country or corporation is required to report their supply chain for cobalt.\textsuperscript{50} Corporations are not subject to many of the international declarations and treaties that apply to nations regarding forced labor.\textsuperscript{51} The United Nations Global Compact and the Organization for Economic Co-Operation and Development (OECD) Guidelines for Multinational Enterprises (the OECD Guidelines) are important but non-binding frameworks for global human rights standards.\textsuperscript{52} In addition, the UN Guiding Principles on Business and Human Rights (UNGP) provides a framework for companies to minimize harm by

\textsuperscript{42} Frankel, Whoriskey, and Ribas, \textit{The Cobalt Pipeline}
\textsuperscript{43} Ibid
\textsuperscript{44} Mantz, \textit{Improvisational economies}, pg 46
\textsuperscript{45} Ibid
\textsuperscript{46} Frankel, Whoriskey, and Ribas, \textit{The Cobalt Pipeline}
\textsuperscript{47} Amnesty International, \textit{This Is What We Die For}, pg 23-24
\textsuperscript{48} Wakefield, \textit{Apple, Samsung, and Sony face...}
\textsuperscript{49} Frankel, Whoriskey, and Ribas, \textit{The Cobalt Pipeline}
\textsuperscript{50} Amnesty International, \textit{This Is What We Die For}, pg 66
\textsuperscript{51} Feasley, \textit{Eliminating Corporate Exploitation}, pg 20
\textsuperscript{52} Ibid
ensuring human rights are being met within their operations, even if that country’s government does not fulfill those obligations.\footnote{Amnesty International, \textit{This Is What We Die For}, pg 40}

OECD Guidelines are voluntary recommendations for enterprises to conduct responsible business globally.\footnote{OECD Guidelines, pg 13} Under these principles, a “high risk area” is defined as “areas of political instability or repression, institutional weakness, insecurity, collapse of civil infrastructure and widespread violence. Such areas are often characterized by widespread human rights abuses and violations of national or international law.”\footnote{Ibid} Given this definition, the Katanga province should be classified as a “high risk area.” However, since OECD is non-binding, legal action cannot be taken against non-compliant companies.

The OECD Guidelines acknowledge that companies have different responsibilities throughout the supply chain. To account for this difference, companies are categorized as upstream (such as smelters and traders in the country of origin) and downstream (companies that buy the processed cobalt or sell components or products containing cobalt).\footnote{Amnesty International, \textit{This Is What We Die For}, pg 42} Upstream companies should be able to trace the mineral back to its source and the circumstances of extraction. While most companies only complete due diligence\footnote{Due Diligence is defined by the UNGPs as the measures companies take “to identify, prevent, mitigate and account for how they address their impacts on human rights.”} for the required conflict minerals, the OECD guidelines recommend application to all minerals.

The 2010 Dodd-Frank financial reform law includes Section 1502 specifically discussing conflict minerals. This section of the bill requires “publicly listed American companies to disclose whether any of their products included minerals from mines controlled by armed groups in or around Congo.”\footnote{Gettleman, \textit{Price of Precious}} They are required “to carry out a ‘due diligence’\footnote{Due Diligence is defined by the UNGPs as the measures companies take “to identify, prevent, mitigate and account for how they address their impacts on human rights.”} review of their supply chain to determine whether their mineral purchases are funding armed groups in eastern DRC.”\footnote{US Dodd-Frank Act} However, cobalt is not included in this legislation.

Despite its exclusion from Dodd-Frank, the exploitative and forced labor practices surrounding cobalt in the DRC could constitute a violation of the 13\textsuperscript{th} Amendment to the US Constitution. The 13\textsuperscript{th} Amendment abolished slavery and involuntary servitude, except for use as punishment of a crime. Kevin Bales and Austin Choi-Fitzpatrick made an argument that slavery via corporations can happen in three
ways. They cite a Supreme Court ruling that, “if companies profit from slavery, then they are in violation of the Thirteenth Amendment.” Given that the State Department has identified known practices of forced labor in artisanal mining in the DRC, as well as the lack of any other options for livelihoods, the dangerous conditions of cobalt artisanal mining could be considered slavery. Following this logic, American companies – from Apple to Tesla – that utilize cobalt are benefiting from the slavery that produces this mineral so cheaply. Therefore, despite arguments that they are not legally compelled to clean up their cobalt supply chain given its exclusion from the Dodd-Frank Act, they are indeed in violation of the 13th Amendment.

**Cobalt’s Pathway to the Global Market**

Cobalt mined in small-scale operations in Katanga is usually refined in country, transferred to South Africa, further processed in Asia, made into battery cathodes, sold to battery producers, and finally sold to major consumer product manufacturers. Many companies, point to a “massively complicated supply chain” to justify why their original source of cobalt is unknown. The Amnesty International report rejects this excuse and emphasizes “the value of law in influencing corporate behavior.” They point to references made by companies about not tracking their supply chain because of cobalt’s exclusion from regulation.

The supply chain starts with the extraction of cobalt by artisanal miners and other small-scale Congolese mines. The ore that is collected is sold to small shops, called “compotirs,” that buy it based on percentage content and weight. Sometimes “negociants” serve as middlemen between miners and the shops – unfortunately, miners are often indebted to their negociants, which forces them to continue mining. In Kolwezi, capital of Lualaba Province in the southern part of the country, Musompo is the marketplace where 50+ compotirs exist. It is illegal for compotirs to be run by foreigners, but it’s unclear how many Congolese are actually involved in these small shops.

The licensed trading houses then sell the cobalt to smelters for processing. From the marketplace in Musompo, all the shops sell to CDM, a Chinese smelter. CDM refines the mineral at their enormous

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61 According to Bales and Choi-Fitzpatrick, the three ways corporations can be complicit to slavery include “(1) an American company can directly subject foreign workers to slavery; (2) the company can hire someone else to subject the workers to slavery; (3) the company can profit from slavery that it has no part in creating.”
62 Bales and Choi-Fitzpatrick, *The Anti-Slavery Movement*, pg 211
63 State Department, *TIP Report*, pg 137
64 Amnesty International, *This Is What We Die For*, pg 47
65 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
66 Amnesty International, *This Is What We Die For*, pg 65
67 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
68 Perks, *Towards a Post-Conflict Transition*, pg.181
69 Frankel, Whoriskey, and Ribas, *The Cobalt Pipeline*
70 Ibid
facility in DRC, and then ships the mineral to its parent company, Zhejiang Huayou Cobalt (Huayou), a major global cobalt producer. Other smelting facilities exist within the DRC, but CDM dominates literature about this tier in the chain; multiple sources refer to the company as the biggest buyer of artisanally mined cobalt within DRC. The companies that buy cobalt and then process it at smelters represent upstream companies in the supply chain.\footnote{Amnesty International, This Is What We Die For, pg 47}

Huayou sells the refined cobalt to battery cathode manufacturers, primarily in China and South Korea.\footnote{This includes the following companies: Hunan Shanshan, Pulead Technology Industrym and L&F Material, as cited in Amnesty International, This Is What We Die For.} Battery cathodes are then sold to battery manufacturers, including Samsung SDI, Amperex Technology Ltd (ATL) and LG Chem. Batteries from Samsung, ATL and LG all supply Apple. Amazon products such as Kindles also have battery cells from ATL.

At every step of the supply chain, companies obtain cobalt and refined cobalt from various suppliers, and the sources of minerals and products create a complicated web. For instance, Apple has batteries from LG and Samsung SDI whose cathodes come from a company that sources cobalt from Congo, but not from CDM. However, Apple also told investigators that 20\% of their cobalt came from Huayou Cobalt.\footnote{Frankel, Whoriskey, and Ribas, The Cobalt Pipeline} Similarly, Samsung SDI uses cobalt exported from Congo, but believes its products to Apple, Samsung and BMW do not contain tainted cobalt.

China’s increasing role in Africa’s mining is closely tied to cobalt. China’s economic boom has caused an increased demand for metals and minerals\footnote{Kennes, The Mining Sector in Congo, pg 153} and the supply has originated mostly in the DRC. In 2005, “approximately three-quarters of all cobalt made in China derived from imported concentrates,” that came from the Congo.”\footnote{Chan-Fishel, Environmental Impact, pg. 145} However, criticisms of labor practices within powerful Chinese companies working with cobalt is common. Huayou received harsh criticism when Bloomberg News published a 2008 story about its dependence on child labor in the Congo.\footnote{Wilson, Tech Giants Accused}

Major companies, including BMW, Ford Motor, Apple, Microsoft, Tesla, LG, Samsung, and Amazon are downstream companies of the cobalt supply chain. These industry giants will likely need more cobalt in coming years. Demand is expected to double by 2020 after having already tripled the last five years.\footnote{Frankel, Whoriskey, and Ribas, The Cobalt Pipeline} This is in part due to the increasing demand by car manufacturers to sell electric cars – an ironic demand for green technology dependent on exploitative and dangerous labor. This section aims to convey the complicated web within this supply chain, but also to emphasize the importance of better monitoring of that supply chain. The digital age is dependent on lithium-ion batteries, and while millions enjoy new

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\item \footnote{Frankel, Whoriskey, and Ribas, The Cobalt Pipeline}
\item \footnote{Kennes, The Mining Sector in Congo, pg 153}
\item \footnote{Chan-Fishel, Environmental Impact, pg. 145}
\item \footnote{Wilson, Tech Giants Accused}
\item \footnote{Frankel, Whoriskey, and Ribas, The Cobalt Pipeline}
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technologies, no one stops to ask how they are created. These innovative companies should be able to use their own sophisticated technologies to track the raw materials needed in their products.

III. The Obsession with Technology and Apple’s Responsibility

After the 2016 release of the Amnesty International report connecting cobalt with forced labor and exploitation, numerous companies, including Apple, Sony, Samsung, Volkswagen and Tesla faced increased pressure to evaluate their supply chains. For companies like Tesla who have built their brands on innovation and ethical consumption, it should be an urgent priority to align their operations with the principles they espouse.

Apple, a major player in the technology industry, has made bold commitments for ensuring responsible and ethical labor practices, but must go farther. Apple’s 2016 Supplier Responsibility Report commits to hold “suppliers accountable to the highest standards, and by partnering with them to make lasting change, we continue to drive responsibility throughout our global supply chain.” Cited as a success in Apple’s Conflict Minerals Report, after five years, “100% of the identified smelters and refiners in Apple’s supply chain for current products were participating in an independent third party conflict minerals audit program.”

In the most recent Information and Communication Technology (ICT) Benchmark published by Know the Chain (KTC), Apple received an overall score of 62 out of 100; Apple was ranked second within this ICT benchmark report “with a higher degree of transparency and disclosure of its risk management of forced labor in its supply chain.” KTC was founded in 2013 by Humanity United to promote the California Supply Chain Transparency Act (SB 657), a recent piece of legislation that requires certain companies conducting business in California to disclose their efforts to remove slavery and human trafficking from their supply chain. KTC lauded Apple’s traceability and risk assessment efforts to eliminate conflict minerals from their supply chain. Looking forward, the benchmark

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78 Mantz, Improvisational economies, pg 44
79 Frankel, Whoriskey, and Ribas, The Cobalt Pipeline
80 Apple, Supplier Responsibility Progress Report, pg 27
81 Apple, Conflict Minerals Report, pg 2
82 Know the Chain, ICT Benchmark: Company Scorecard
83 The criteria to be subject to the law are described as followed in the legislation: “It must: (a) identify itself as a retail seller or manufacture in its tax returns; (b) satisfy the legal requirements for “doing business” in California; and (c) have annual worldwide gross receipts exceeding $100,000,000.”
84 State of California, SB 657
85 Know the Chain, ICT Benchmark: Company Scorecard
encouraged the company to “disclose a process for assessing risks for forced labor at potential suppliers prior to entering into any contracts with them.”

Starting in 2017, secondary sources claim “Apple will internally treat cobalt like a conflict mineral, requiring all cobalt refiners to agree to outside supply-chain audits and conduct risk assessments.”

Officially, Apple is evaluating “dozens of different materials, including cobalt, in order to identify labour and environmental risks as well as opportunities to bring about effective, scalable, and sustainable change.”

Apple could undoubtedly bring that change itself if the company was committed to its cobalt supply chain.

There’s a painful disconnect in the promise of innovative technology to transform global challenges based on minerals that are extracted in exploitative and dangerous situations. For example, electric cars have the potential to eventually remove dependence on oil. Tesla’s brand is built on ethical consumption, promoting “cars without compromise.”

But the battery for each electric car depends on 15,000 grams of refined cobalt. With such a messy supply chain, and no legal requirement to track the original extraction, how can Tesla’s use of cobalt be ethical? Or do their ethics only apply to the environment?

IV. Conclusion

As Mantz described, “it is important to remember that the ore these miners carve precariously out of the earth is the material bedrock on which the entire digital age, and everything associated with it, is founded.” Despite its exclusion from the list of conflict minerals, the labor conditions of cobalt represent ongoing violence against the miners digging in extremely dangerous conditions.

International governments and corporations must have the long-term goal to support the DRC’s capacity to develop a flourishing mining sector led by local professionals. Until then, consumers of digital devices as well as the international community must put pressure on technology manufacturers to clean up their supply chains. Brands like Apple and Tesla have the most power to impact the supply chain and improve the labor conditions of those who dig for cobalt.

This research paper calls on technology companies to ensure their products contain cobalt that is not mined under dangerous conditions. Consumers of technology should be outraged by the working

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86 Ibid
87 Frankel, Whoriskey, and Ribas, The Cobalt Pipeline
88 Wakefield, Apple, Samsung, and Sony face...
89 Tesla, About Tesla
90 Mantz, Improvisational economies, pg 48.
91 George, The Power of Mining to Transform
conditions present in the supply chain of prized digital gadgets. The largest companies in the technology industry must step up to ensure the raw materials necessary for their products, such as cobalt, are obtained ethically. Apple should step into a leadership role as soon as possible and fulfill its commitment to “effective, scalable, and sustainable change.” These companies have the potential to cause real change for the Congolese miners who are risking their lives every day. They can and should protect the humanity of the people who make their products possible.
References


