

Critical Minerals, Environmental Justice, and African Communities: An Eco-Humanities Perspective on the China–United States Strategic Rivalry

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Abstract

This paper examines the growing global competition between China and the United States over Africa's critical mineral resources and its implications for environmental justice, indigenous communities, cultural heritage, and sustainable development. While critical minerals such as cobalt, lithium, copper, manganese, graphite, and rare earth elements are essential for renewable energy technologies, electric vehicles, and advanced industries, their extraction has generated significant ecological and social consequences in many African communities. Using an eco-humanities perspective, the study explores how mineral extraction intersects with histories of colonial resource exploitation, contemporary geopolitical rivalry, Indigenous knowledge systems, and ethical debates surrounding environmental responsibility. Through qualitative analysis of secondary sources, including scholarly literature, policy reports, environmental justice studies, and community-based documentation, the paper argues that the China–United States mineral competition risks reproducing extractive relationships unless African communities are placed at the centre of resource governance. The study concludes by advocating for a justice-orientated approach that integrates ecological sustainability, cultural preservation, community participation, and equitable development.

Keywords: Critical Minerals; Environmental Justice; Eco-Humanities; China–United States Rivalry; African Communities; Indigenous Knowledge; Sustainable Development; Resource Extraction.

Accepted 7/7/2026

Published 29/7/2026

1. INTRODUCTION

The Global Race for Critical Minerals and Africa's Resource Dilemma

The transition toward a low-carbon global economy has significantly increased the strategic importance of critical minerals, which are essential components of renewable energy technologies, electric vehicles, digital infrastructure, and advanced defence systems. Minerals such as cobalt, lithium, copper, graphite, nickel, and rare earth elements have become central to global efforts to decarbonise energy systems and expand technological innovations. Unlike traditional fossil fuels, whose importance has historically been associated with

industrial development and geopolitical power, critical minerals have emerged as the foundation of the emerging green economy. However, the rapid expansion of mineral demand has generated new environmental, social, and ethical challenges, particularly in resource-rich regions of the Global South where extraction activities often occur (International Energy Agency [IEA], 2021; Sovacool et al., 2020).

Africa occupies a central position in this emerging mineral economy because of its extensive reserves of

several minerals considered essential for energy transitions and technological industries. The Democratic Republic of Congo (DRC), for example, possesses some of the world's largest cobalt reserves, while countries such as Zimbabwe, Namibia, Zambia, Mozambique, and Madagascar have significant deposits of lithium, graphite, copper, and other strategic resources. The continent's mineral wealth has attracted growing attention from global powers seeking to secure supply chains for clean energy technologies and strategic industries. The International Energy Agency (2021) notes that the geographical concentration of critical mineral production creates supply vulnerabilities, encouraging major economies to establish stronger relationships with mineral-producing countries. Consequently, Africa has become a major arena in the expanding strategic competition between China and the United States over access to resources, infrastructure partnerships, and influence in global mineral governance.

Recent discoveries of rare earth elements, niobium, and coltan in Kenya further illustrate how new mineral frontiers are expanding the geopolitical competition between China and the United States across the African continent.

Recent mineral discoveries in Kenya further demonstrate that Africa's strategic importance continues to expand beyond the traditional mining economies of the Democratic Republic of Congo, Zambia, Zimbabwe, and Mozambique. Geological studies have found large amounts of rare earth elements, niobium, and coltan-tantalite (coltan), particularly at Mrima Hill in Kwale County and in Embu County. These discoveries have increased international interest in Kenya as an emerging supplier of critical minerals required for electric vehicles, renewable energy technologies, semiconductors, and advanced defence systems. Consequently, Kenya has become part of the growing geopolitical competition among major powers seeking to secure resilient and diversified critical mineral supply chains (Hund et al., 2025; Sovacool et al., 2020; Bridge, 2004).

China's longstanding involvement in African mining, infrastructure development, and mineral processing has positioned it as a dominant actor in several critical mineral supply chains. Chinese companies have invested heavily in cobalt, copper, lithium, and other mineral sectors, while China's control over significant portions of global mineral refining capacity has increased its strategic influence in clean technology industries (Hund et al., 2023). In response, the United States and its allies have increasingly sought to diversify critical mineral supply chains and reduce dependence on Chinese-controlled processing networks. Initiatives aimed at strengthening mineral partnerships with African states reflect broader concerns about economic security, technological competition, and geopolitical influence (U.S. Geological Survey [USGS], 2024). However, this rivalry raises important questions about whether Africa's mineral resources will support inclusive development or reproduce historical patterns of external resource dependency.

We must also understand the global competition for critical minerals within the historical context of Africa's extractive economies. For centuries, African resources have been incorporated into global economic systems through colonial and postcolonial arrangements that often prioritised external interests over local development. Scholars of political ecology argue that resource extraction in many African contexts continues to reflect unequal relationships between global markets, multinational corporations, states, and local communities (Bebbington, 2012; Bridge, 2004). Although contemporary mining investments differ from colonial forms of extraction, concerns remain regarding environmental degradation, limited local value addition, labour exploitation, displacement, and the unequal distribution of mining benefits. The expansion of critical mineral extraction risks creating a new phase of resource dependency if African countries remain primarily exporters of raw materials rather than participants in mineral processing and value creation.

Beyond economic concerns, critical mineral extraction presents significant environmental justice challenges. Mining activities frequently generate ecological consequences, including deforestation, water contamination, biodiversity loss, soil degradation, and disruption of agricultural livelihoods. These environmental burdens are often experienced most intensely by rural and indigenous communities that have limited influence over mining decisions but depend directly on local ecosystems for survival. Environmental justice scholarship highlights that ecological harms are not distributed equally; instead, socially and economically marginalised populations often bear disproportionate environmental risks while receiving limited economic benefits (Schlosberg, 2007). In African mining contexts, questions of justice therefore extend beyond compensation and employment opportunities to include community participation, recognition of indigenous rights, protection of cultural landscapes, and respect for local ecological knowledge.

An environmental humanities approach provides an important framework for examining these issues because it moves beyond viewing minerals as purely economic commodities. Environmental humanities scholarship emphasises the cultural, ethical, and historical relationships between humans and the natural world, challenging approaches that reduce landscapes to extractive resources alone (Heise, 2008; Nixon, 2011). For many African communities, land and ecosystems possess social, spiritual, and cultural meanings that Many African communities attribute social, spiritual, and cultural meanings to land and ecosystems that market calculations cannot capture. through market calculations. Mining-induced transformations of landscapes may therefore represent not only environmental damage but also threats to collective identities, ancestral connections, and cultural heritage. Incorporating these perspectives allows critical mineral debates to consider the lived experiences of communities affected by extraction and

the ethical responsibilities associated with global energy transitions.

Despite increasing research on critical minerals, energy transitions, and geopolitical competition, significant gaps remain in understanding the human and cultural dimensions of mineral extraction in Africa. Existing debates frequently focus on supply chain security, economic development, and technological competition, while giving comparatively limited attention to indigenous knowledge systems, environmental ethics, cultural heritage, and community experiences. An eco-humanities perspective addresses this gap by examining critical minerals as both material resources and socially embedded elements within complex relationships between people, places, and ecosystems.

This study therefore examines the implications of China–United States strategic rivalry over African critical minerals through the lens of environmental justice and eco-humanities. It investigates how global competition for mineral resources affects African communities, ecosystems, and cultural landscapes while exploring pathways toward more ethical and sustainable mineral governance.

1.2 Research Objectives

The main objective of this study is to examine the implications of the China–United States strategic rivalry over African critical minerals through an environmental humanities and environmental justice perspective. Specifically, the study seeks to achieve the following objectives:

1. To examine how China–United States competition over African critical minerals influences local communities, ecosystems, and patterns of resource governance.
2. To analyse the environmental justice challenges associated with critical mineral extraction in Africa, including ecological degradation, community displacement, labour concerns, and the unequal distribution of economic benefits.
3. The study aims to explore how eco-humanities perspectives can contribute to ethical, culturally sensitive, and sustainable approaches to critical mineral governance in Africa.

1.3 Research Questions

The study is guided by the following research questions:

1. How does China–United States competition over African critical minerals affect local communities and ecosystems?
2. What environmental justice challenges emerge from critical mineral extraction in Africa?
3. How can eco-humanities perspectives contribute to more sustainable and ethical mineral governance?

2 LITERATURE REVIEW AND THEORETICAL

2.1 Introduction: Rethinking Critical Minerals beyond Economic Value

The growing global demand for critical minerals has generated extensive scholarly debate concerning energy transitions, resource security, environmental sustainability, and geopolitical competition. Existing literature largely approaches critical minerals through economic, technological, and strategic lenses, emphasizing global supply chains, industrial competitiveness, decarbonization, and national security (Ali et al., 2017; Church & Crawford, 2020; Hund et al., 2020). Within this perspective, critical minerals are primarily viewed as strategic commodities essential for renewable energy technologies, electric vehicles, battery storage, and advanced digital industries. Consequently, policy discussions have focused on securing reliable mineral supply chains, reducing import dependency, and strengthening geopolitical influence over mineral-rich regions, particularly in Africa.

While these approaches have significantly advanced understanding of global mineral governance, they often overlook the complex social, cultural, historical, and ecological dimensions that shape mineral extraction. Critical minerals are embedded within landscapes that support livelihoods, cultural heritage, biodiversity, and indigenous knowledge systems. Their extraction therefore extends beyond economic production, generating profound implications for local communities, ecosystems, governance institutions, and intergenerational sustainability (Bridge, 2004; Le Billon, 2012; Bebbington et al., 2018). Recognising these limitations, this study adopts an interdisciplinary theoretical framework that integrates environmental humanities, environmental justice, and political ecology to analyse critical minerals not merely as economic assets but as socio-ecological resources situated within relationships of power, ethics, identity, and environmental stewardship.

The environmental humanities provide an important conceptual foundation by challenging the dominant anthropocentric assumption that nature exists primarily as a reservoir of resources for human exploitation. Rather than treating environmental issues solely as scientific, technological, or economic problems, environmental humanities examine how societies construct meanings around landscapes, ecosystems, and non-human life through culture, history, literature, ethics, and philosophy (Heise, 2008; Rose et al., 2012; O'Gorman et al., 2019). This perspective recognises that land possesses multiple forms of value—including cultural, spiritual, historical, and ecological significance—that cannot be adequately captured through market valuation alone. In many African societies, land represents the foundation of community

identity, customary governance, ancestral heritage, and social cohesion. Consequently, mining activities frequently transform not only physical landscapes but also cultural memory, indigenous knowledge systems, and long-standing relationships between people and nature.

Environmental humanities further emphasise the ethical dimensions of sustainability by encouraging more inclusive understandings of human responsibility towards ecosystems and future generations (Braidotti, 2013; Nixon, 2011). Nixon's concept of slow violence is particularly relevant in understanding how environmental degradation associated with mining often unfolds gradually through pollution, biodiversity loss, water contamination, and ecosystem degradation, producing cumulative social and ecological impacts that remain largely invisible within conventional economic assessments. This perspective is especially valuable in analysing the long-term consequences of critical mineral extraction in Africa, where environmental costs frequently persist long after mining operations have ceased.

Environmental justice constitutes the second pillar of this theoretical framework. Emerging from scholarship examining unequal environmental burdens across race, class, and marginalised communities, environmental justice argues that environmental benefits and harms are distributed unevenly across society (Bullard, 1990; Schlosberg, 2007). The framework extends beyond distributive justice to include procedural justice, which concerns equitable participation in environmental decision-making, and recognition justice, which emphasises respect for diverse identities, knowledge systems, and cultural values (Fraser, 2008; Schlosberg, 2013). Within the context of Africa's critical minerals, environmental justice highlights how local communities often bear the environmental and social costs of extraction—including land dispossession, pollution, displacement, health risks, and livelihood disruption—while receiving relatively limited economic benefits. At the same time, decision-making concerning mineral governance is frequently dominated by governments, multinational corporations, and external investors, leaving affected communities with limited opportunities to influence policies that directly affect their lives.

Political ecology complements environmental justice by examining how environmental change is shaped by political, economic, and institutional power. Political ecology rejects explanations that attribute environmental degradation solely to ecological or technological factors, arguing instead that environmental outcomes are deeply embedded within historical processes of colonialism, capitalism, state formation, and global political economy (Blaikie & Brookfield, 1987; Robbins, 2020). Scholars within political ecology demonstrate that access to natural resources is determined not only by physical availability but also by unequal power relations that influence ownership, regulation, investment, and governance (Bryant & Bailey, 1997; Peluso & Watts, 2001).

Applied to critical minerals, political ecology reveals how the global energy transition may simultaneously reinforce

new forms of resource dependency and geopolitical competition. Although renewable energy technologies contribute to climate change mitigation, the extraction of minerals required to support these technologies often reproduces longstanding inequalities between mineral-producing countries and industrialised economies that dominate processing, manufacturing, and technological innovation (Bridge, 2008; Le Billon & Spiegel, 2022). African countries therefore occupy a paradoxical position: they possess globally significant mineral resources essential for the green transition while continuing to capture only a limited share of value addition due to weak industrial capacity, governance challenges, and asymmetrical global trade structures.

Integrating environmental humanities, environmental justice, and political ecology provides a comprehensive framework for understanding the multidimensional implications of critical mineral extraction. Environmental humanities illuminate the cultural, ethical, and ecological meanings attached to landscapes; environmental justice examines equity, participation, and rights; while political ecology analyses the political-economic structures that shape resource governance and environmental change. Together, these complementary perspectives enable this study to move beyond conventional economic analyses by examining how global competition for Africa's critical minerals intersects with environmental governance, social justice, local livelihoods, cultural heritage, and sustainable development. The framework is particularly appropriate for investigating how mineral governance can balance economic transformation with environmental protection, community participation, and long-term ecological sustainability within Africa's emerging role in the global green economy.

2.2 Environmental Justice Theory: Inequality, Recognition, and Participation in Resource Governance

Environmental justice theory emerged from struggles the unequal environmental burdens experienced by marginalised communities, particularly those environmental burdens experienced by marginalised communities, particularly communities affected by industrial pollution, hazardous waste, and extractive activities. The central argument of environmental justice scholarship is that environmental risks and benefits are not distributed equally across societies. Instead, vulnerable populations often bear disproportionate ecological costs while powerful actors—including governments, corporations, and global industries—capture greater economic benefits (Schlosberg, 2007). This framework is highly relevant to critical mineral extraction in Africa, where communities located near mining sites frequently experience environmental degradation, displacement, health risks, and livelihood disruptions.

Scholars have expanded environmental justice beyond questions of distribution to include issues of

recognition and participation. Fraser (2000) argues that justice requires not only a fair distribution of resources but also recognition of marginalised groups whose identities, experiences, and knowledge systems are often excluded from decision-making processes. Similarly, Schlosberg (2007) emphasises that environmental justice involves three interconnected dimensions: distributive justice, procedural justice, and recognition justice. Distributive justice concerns the unequal allocation of environmental benefits and harms; procedural justice focuses on whether affected communities have meaningful participation in environmental decisions; and recognition justice addresses whether diverse cultural perspectives and identities are respected.

These dimensions are particularly important in African mining contexts because many extraction projects are negotiated between governments and multinational corporations while local communities have limited influence over decisions affecting their lands. Research on extractive industries demonstrates that communities frequently face displacement, pollution, and loss of traditional livelihoods while receiving limited economic benefits from resource exploitation (Bebbington, 2012). The environmental justice perspective therefore challenges development models that measure mining success primarily through economic growth while ignoring ecological destruction and social consequences.

Environmental justice scholarship also highlights the importance of Indigenous and local ecological knowledge. Indigenous communities often possess detailed understandings of ecosystems developed through long-term relationships with particular landscapes. However, modern resource governance systems frequently marginalise these forms of knowledge by prioritising scientific, technical, and economic assessments over cultural and community-based perspectives (Whyte, 2017). Applying environmental justice theory to critical mineral extraction, therefore, requires recognising communities not as passive recipients of development but as active participants and knowledge holders whose experiences are essential for sustainable resource governance.

2.3 Political Ecology: Power, Extraction, and Global Resource Competition

Political ecology provides another important theoretical foundation for understanding critical mineral extraction because it examines how political and economic power shapes relationships between societies and environments. Unlike approaches that treat environmental degradation as the result of technological or population pressures alone, political ecology argues that environmental problems are produced through historical processes involving capitalism, colonialism, governance structures, and unequal global relations (Robbins, 2012).

Political ecology scholars have demonstrated that natural resources are not simply discovered and extracted; rather, they become valuable through political and economic systems that determine who controls resources, who benefits from extraction, and who bears environmental costs. In this sense, relationships among states, multinational corporations, financial institutions, and local communities shape mineral extraction. The relationships among states, multinational corporations, financial institutions, and local communities shape mineral extraction. The global demand for cobalt, lithium, copper, and other critical minerals reflects broader political and economic transformations associated with renewable energy transitions and technological competition.

Within African contexts, political ecology draws attention to the historical continuity between colonial resource extraction and contemporary global mining practices. Colonial economies often positioned African territories as suppliers of raw materials for external industries, creating patterns of dependency that continue to influence contemporary resource relationships (Rodney, 1972; Obafemi, 2023). Although postcolonial states have gained political independence, many remain dependent on mineral exports while lacking sufficient industrial capacity for processing and value addition. This creates economic vulnerabilities and limits the developmental benefits derived from natural resources.

Therefore, we can analyse the China–United States strategic rivalry over critical minerals through a political ecology lens. Competition between global powers reflects not only economic interests but also struggles over control of supply chains, technological dominance, and geopolitical influence. While foreign investment can contribute to infrastructure development and economic opportunities, political ecology scholars caution that external resource interests may reinforce unequal relationships if local communities and national development priorities are marginalised (Bridge, 2004). This perspective emphasises the necessity of examining not only who extracts minerals but also who controls decision-making, who benefits economically, and whose environmental values are recognised.

2.4 Eco-Humanities Perspective: Culture, Nature, and Ethical Relationships with Land

The environmental humanities expands discussions of sustainability by exploring the cultural, ethical, historical, and philosophical dimensions of human relationships with nature. It challenges the separation between society and environment that has often dominated modern economic thinking. Instead, environmental humanities scholars argue that human societies are deeply interconnected with ecological systems and that environmental challenges must be understood through narratives, values, identities, and

cultural practices (Heise, 2008; Nixon, 2011).

This perspective is particularly significant for examining critical mineral extraction in African communities because land is often understood not simply as property or economic space but as a source of identity, memory, spirituality, and collective belonging. Many indigenous and local communities maintain relationships with landscapes that involve ancestral connections, cultural traditions, and ecological responsibilities. The transformation of these landscapes through mining may therefore represent cultural disruption as well as environmental change.

Nixon (2011) introduces the concept of “**slow violence**” to describe environmental harm that occurs gradually and often invisibly, affecting vulnerable communities over extended periods. This concept is useful for analysing mining-related impacts because ecological destruction, pollution, and social displacement may develop over time rather than through immediate visible events. Communities affected by mining may experience cumulative losses, including damaged ecosystems, weakened cultural practices, and reduced access to traditional resources.

The eco-humanities perspective also emphasises the importance of indigenous ecological knowledge in addressing environmental challenges. Indigenous knowledge systems provide alternative ways of understanding sustainability by recognising the relationships between humans, animals, plants, landscapes, and future generations. Scholars argue that addressing contemporary environmental crises requires greater engagement with diverse knowledge systems rather than relying exclusively on Western scientific and economic frameworks (Kimmerer, 2013; Whyte, 2017).

In relation to critical minerals, an eco-humanities approach asks broader ethical questions: How should societies balance technological progress with ecological responsibility? Who is entitled to define the value of landscapes? How can mineral extraction occur without destroying cultural heritage and community relationships with nature? These questions expand the debate beyond resource availability toward questions of justice, responsibility, and sustainability.

2.5 Integrating Environmental Justice, Political Ecology, and Eco-Humanities for Critical Mineral Analysis

Although environmental justice, political ecology, and eco-humanities emerge from different intellectual traditions, they share important concerns regarding power, inequality, and human relationships with the environment. Environmental justice provides a framework for analysing unequal environmental burdens and community participation; political ecology explains how global economic and political systems shape resource extraction, while eco-humanities reveal the cultural and

ethical meanings attached to landscapes and ecological relationships.

Together, these perspectives provide a comprehensive framework for examining Africa's critical mineral dilemma within the context of China–United States strategic competition. They allow this study to move beyond narrow economic interpretations of minerals and investigate how extraction processes influence communities, ecosystems, and cultural identities. The integrated framework argues that sustainable mineral governance requires more than technological solutions or increased investment; it requires recognition of environmental rights, indigenous knowledge, community participation, and ethical responsibilities toward ecosystems.

Therefore, this study uses environmental justice, political ecology, and eco-humanities as complementary theoretical lenses to analyse whether the global race for critical minerals can support sustainable development in Africa or whether it risks reproducing historical patterns of extraction and inequality.

3. CRITICAL MINERALS, AFRICAN COMMUNITIES, AND THE HUMAN COST OF EXTRACTION

3.1 Introduction: Critical Minerals and the Social Consequences of the Green Transition

The global transition toward renewable energy technologies has intensified demand for critical minerals, transforming Africa into a strategically important region in the emerging global mineral economy. While critical minerals are presented as essential resources for combating climate change and accelerating Decarbonisation, their extraction has generated significant social and environmental challenges for communities located near mining sites. The production of cobalt, lithium, copper, graphite, and other strategic minerals has created economic opportunities through employment, investment, and infrastructure development; however, these benefits have frequently been accompanied by environmental degradation, displacement, labour exploitation, and conflicts over land rights.

Scholars have argued that the transition to a low-carbon economy does not automatically guarantee a just transition. Instead, renewable energy systems may reproduce existing patterns of inequality if the extraction of required minerals relies on environmentally destructive practices and the marginalization of resource-dependent communities (Sovacool et al., 2020). In Africa, where many mining regions have experienced decades of resource extraction under colonial and postcolonial economic systems, the expansion of critical mineral industries raises concerns about whether the green transition will create new forms of dependency or contribute to inclusive and sustainable development.

In the case of South Sudan, the mineral sector remains underdeveloped but highly promising, with the country identified as having deposits of gold, copper, zinc, manganese, iron, rare earth elements, and other minerals that could support future energy-transition industries and economic diversification (Ministry of Mining, Republic of South Sudan, 2026; SFA Oxford, 2025). However, South Sudan also faces major governance, infrastructure, and conflict-related constraints that limit the ability of mineral extraction to generate broad-based development benefits. Existing environmental assessments note that weak institutional capacity, environmental degradation, and competition over natural resources can intensify local vulnerabilities and community tensions in South Sudan (Capacity4Dev, 2022; CSRF South Sudan, 2024). As a result, the country illustrates the broader African dilemma in which mineral wealth may offer economic opportunity while also reproducing inequality, environmental stress, and social exclusion if extraction is not carefully governed. From an environmental justice perspective, the central challenge is that communities hosting mineral resources often experience the greatest environmental and social costs while receiving limited control over resource decisions and unequal shares of economic benefits (Schlosberg, 2007). The extraction of critical minerals therefore represents not only an economic process but also a struggle over land, identity, ecological security, and community rights. This section examines these challenges through case studies of cobalt mining in the Democratic Republic of Congo (DRC), lithium extraction in Zimbabwe and Namibia, copper mining in Zambia, graphite mining in Mozambique, and the emerging mineral governance context of South Sudan.

3.2 Cobalt Mining in the Democratic Republic of Congo: Artisanal Labour, Environmental Harm, and Community Vulnerability

The Democratic Republic of Congo occupies a central position in global critical mineral supply chains because it possesses some of the world's largest cobalt reserves, a mineral essential for lithium-ion batteries used in electric vehicles, smartphones, and renewable energy storage technologies. The country produces a significant proportion of global cobalt supply, making it strategically important for both China's industrial economy and Western efforts to secure clean energy supply chains (Hund et al., 2023). However, cobalt extraction in the DRC has generated substantial environmental and social concerns, particularly regarding artisanal and small-scale mining communities.

Artisanal cobalt mining provides livelihoods for thousands of Congolese workers, many of whom enter mining because of limited employment opportunities in other sectors. However, artisanal mining is often characterised by unsafe working conditions, inadequate protective equipment, unstable incomes, and exposure to hazardous environments. Research by Calvão (2021) highlights that cobalt supply chains involve significant

social risks, including labour exploitation and community vulnerability. Reports of child labour and dangerous working conditions in artisanal mining areas have attracted international attention, raising ethical questions regarding the relationship between global clean energy technologies and human rights.

Environmental impacts associated with cobalt mining include soil degradation, water pollution, habitat destruction, and exposure to toxic substances. Mining activities can contaminate water sources used by surrounding communities for drinking, agriculture, and domestic activities. Environmental degradation is particularly concerning because many rural communities depend directly on local ecosystems for food security and livelihoods. Bebbington (2012) argues that extractive industries often transform local environments in ways that undermine traditional economic systems while concentrating decision-making power among governments and corporations.

Beyond environmental consequences, cobalt extraction has affected social and cultural relationships with land. Mining expansion can lead to displacement, loss of agricultural territories, and disruption of community structures. From an eco-humanities perspective, these changes represent more than economic displacement; they involve the weakening of cultural relationships between communities and landscapes. Land in many African societies functions as a source of identity, ancestry, and collective memory rather than merely as a commodity. Therefore, mining-induced landscape transformation creates cultural as well as ecological consequences.

3.3 Lithium Extraction in Zimbabwe and Namibia: Green Transition Opportunities and Local Environmental Concerns

Lithium has become one of the most strategically important minerals because of its essential role in battery production and energy storage technologies. As global demand for electric vehicles and renewable energy systems increases, African countries with lithium deposits have attracted growing international investment. Zimbabwe has emerged as one of Africa's leading lithium producers, while Namibia has also become an important location for lithium exploration and mining activities.

Lithium extraction African governments have presented lithium extraction as an opportunity to promote industrialisation, attract foreign investment, create employment, and diversify the economy. Presented by African governments as an opportunity to promote industrialisation, foreign investment, employment creation, and economic diversification. However, questions remain regarding whether mineral-rich countries will capture sufficient value from their resources or continue exporting raw materials with limited local processing capacity. Historically, African economies have often relied on mineral exports without developing strong domestic manufacturing industries, creating patterns of

dependency within global commodity markets (Auty, 2002).

In Zimbabwe, lithium mining has expanded rapidly due to international demand and foreign investment. However, concerns have emerged regarding environmental management, community participation, and the distribution of economic benefits. The expansion of mining operations may affect agricultural land, water resources, and rural livelihoods, particularly where communities depend on land-based activities. Political ecology perspectives emphasise that resource extraction decisions are shaped by power relations, meaning that local communities may have limited influence over how mining projects are planned and implemented (Robbins, 2012).

Namibia's lithium sector similarly reflects tensions between economic development and environmental protection. Mining projects may provide employment and infrastructure benefits, but they also raise concerns about water consumption, biodiversity impacts, and the protection of ecologically sensitive landscapes. Lithium extraction requires significant water resources, creating challenges in regions already affected by water scarcity. These concerns demonstrate the broader contradiction of the green transition: technologies designed to address climate change may generate new environmental pressures in mineral-producing regions.

An environmental humanities perspective emphasises the necessity of considering how communities understand and value landscapes affected by lithium extraction. Rural and indigenous communities often possess cultural and historical relationships with land that cannot be fully represented through economic compensation. Sustainable mineral governance therefore requires meaningful consultation, recognition of local knowledge, and protection of cultural landscapes.

3.4 Copper Mining in Zambia: Historical Dependency, Pollution, and Environmental Inequality

Copper mining has played a central role in Zambia's economy for more than a century and remains one of the country's most important sources of export revenue. The Copperbelt region represents one of Africa's most significant mining landscapes, attracting multinational investment and contributing to national economic development. However, Zambia's dependence on copper has also created vulnerabilities associated with commodity price fluctuations, environmental degradation, and unequal distribution of mining benefits.

The historical development of Zambia's copper industry reflects broader patterns of colonial and postcolonial resource extraction. During the colonial period, mineral production was structured primarily around external economic interests, and although ownership patterns have changed, dependency on mineral exports remains a major development challenge (BankTrack, 2021). The continued reliance on copper

exports has limited economic diversification and created challenges in ensuring that mining revenues contribute effectively to broader social development.

Environmental concerns associated with copper mining include air pollution, water contamination, and land degradation. Mining waste and chemical pollution have affected surrounding communities, particularly in areas where residents depend on local water systems for domestic and agricultural purposes. Studies of mining communities in Zambia have documented concerns regarding pollution, health impacts, and conflicts between corporations and affected populations (Lindahl, 2014; Mutelo, 2023).

The Zambian case demonstrates the tension between economic development and environmental justice. While mining contributes employment and national revenue, local communities often experience environmental costs without proportionate benefits. Environmental justice theory highlights this imbalance by questioning why communities closest to extraction sites frequently bear the greatest risks while having limited influence over resource governance decisions (Schlosberg, 2007).

3.5 Graphite Mining in Mozambique: Displacement, Livelihood Disruption, and Community Rights

Mozambique has become increasingly important in global graphite supply chains due to rising demand for battery technologies. Graphite is a critical component in lithium-ion batteries, making Mozambique's mineral resources strategically significant within global energy transitions. However, graphite mining projects have raised concerns regarding land access, community displacement, and environmental impacts.

Many mining projects in Mozambique are located in rural areas where communities depend on agriculture, forests, and natural resources for their livelihoods. The conversion of communal land into mining zones can disrupt traditional economic practices and weaken community relationships with ancestral territories. Land is not only an economic resource but also a foundation of social identity and cultural continuity. Consequently, displacement associated with mining may create long-term social and cultural consequences.

Research on extractive industries in Africa shows that relocation processes frequently create conflicts because compensation mechanisms often fail to recognise the broader social value of land-based livelihoods (Bebbington, 2012). Communities may lose access to farming areas, forests, and cultural sites, while replacement settlements may not adequately restore previous living conditions.

Graphite mining also illustrates broader debates concerning who benefits from the global energy transition. Although minerals extracted in Mozambique contribute to renewable energy technologies worldwide, local communities may experience limited improvements in

living conditions. This raises important ethical questions about the fair distribution of the benefits of green technologies across global supply chains.

3.6 Community Resistance, Environmental Activism, and Demands for Justice

Across African mining regions, communities have increasingly challenged extractive practices through environmental activism, legal mobilisation, and demands for greater participation in resource governance. These movements reflect growing awareness that communities should not merely be treated as recipients of mining compensation but as rights-bearing actors with legitimate authority over decisions affecting their environments.

Environmental movements in Africa often combine ecological concerns with struggles for social justice, indigenous rights, and economic accountability. Activists and community organisations have demanded stronger environmental regulations, transparency in mining agreements, fair compensation, and recognition of customary land rights. These struggles demonstrate that resistance to mining is not necessarily opposition to development itself but a demand for alternative models of development that respect ecological limits and community interests.

Indigenous and local knowledge systems have become increasingly important in these debates. Scholars argue that sustainable environmental governance requires recognition of diverse knowledge traditions rather than relying exclusively on corporate and state expertise (Whyte, 2017). Community participation can therefore improve resource governance by incorporating local understandings of ecosystems, risks, and cultural values.

3.7 Conclusion

The extraction of critical minerals in Africa reveals the complex relationship between global energy transitions, economic development, and environmental justice. While cobalt, lithium, copper, and graphite are essential for renewable technologies and digital industries, their production has generated significant social and ecological costs for many African communities. Across the DRC, Zimbabwe, Namibia, Zambia, and Mozambique, mining activities have contributed to environmental degradation, livelihood disruption, displacement, and struggles over cultural landscapes.

These cases illustrate that evaluating the critical mineral transition requires more than just assessing technological or economic achievements. A genuinely sustainable transition requires attention to the communities and ecosystems that supply the minerals upon which global technologies depend. Environmental justice, political

ecology, and eco-humanities perspectives reveal that the future of mineral governance must incorporate community rights, indigenous knowledge, ecological responsibility, and equitable distribution of benefits.

4. CHINA–UNITED STATES STRATEGIC RIVALRY AND THE FUTURE OF AFRICA'S MINERAL GOVERNANCE

4.1 Introduction: Critical Minerals as Instruments of Geopolitical Power

The rising significance of critical minerals has converted mineral resources from mainly economic goods into strategic assets associated with global security, technological rivalry, and geopolitical power. As countries accelerate investments in renewable energy, electric vehicles, artificial intelligence, and advanced defence technologies, access to minerals such as cobalt, lithium, copper, graphite, nickel, and rare earth elements has become central to their national development strategies. Unlike the fossil fuel geopolitics of the twentieth century, contemporary geopolitical competition increasingly revolves around securing reliable and diversified mineral supply chains necessary for the emerging low-carbon economy (International Energy Agency [IEA], 2021).

Africa has become a central arena in this competition because of its extensive reserves of minerals essential to global technological and energy transitions. The continent possesses significant deposits of cobalt in the Democratic Republic of Congo (DRC), copper in Zambia and the DRC, lithium in Zimbabwe and Namibia, and graphite in Mozambique, among other resources. However, Africa's strategic mineral importance exists within a historical context where resource abundance has frequently failed to translate into broad-based development. Scholars of resource politics argue that mineral-rich countries often experience patterns of dependency, limited industrial transformation, and unequal relationships with external economic actors due to their position as exporters of raw materials within global markets (Auty, 2002; Ayala-García & Dall'erba, 2021).

The intensifying rivalry between China and the United States over critical mineral supply chains raises important questions about the future direction of Africa's mineral governance. While both powers present their engagement as supporting economic development, infrastructure expansion, and technological advancement, their strategic interests are also shaped by competition over global manufacturing, supply chain security, and geopolitical influence. This section argues that Africa's mineral future depends not simply on attracting foreign investment but on strengthening African agency, promoting domestic value addition, protecting environmental rights, and ensuring that local communities

become active participants in resource governance.

4.2 China's Role in Africa's Critical Mineral Sector: Investment, Processing Capacity, and Strategic Influence

China has become one of the most influential external actors in Africa's mineral sector, particularly through investments in mining, infrastructure development, and mineral processing. Chinese companies have established significant positions in cobalt, copper, lithium, and other strategic mineral industries, particularly in countries such as the Democratic Republic of Congo and Zambia. China's influence is strengthened by its dominance not only in mineral extraction but also in processing and refining, which are essential stages in global supply chains for clean energy technologies (Hund et al., 2023).

The importance of processing capacity cannot be overstated because mining alone does not determine control over mineral supply chains. The refining, manufacturing, and technological stages of mineral production often generate greater economic value than raw extraction. According to the International Energy Agency (2021), China occupies a leading position in the processing of several critical minerals, giving it substantial influence over global clean energy supply chains. This position has encouraged African countries to seek partnerships with China as a means of attracting investment, infrastructure financing, and industrial development.

Chinese engagement in Africa has contributed to infrastructure construction, including roads, railways, energy projects, and mining-related facilities that can support economic activity. However, scholars have debated whether these investments contribute to long-term development or reinforce extractive economic relationships. Critics argue that infrastructure linked primarily to mineral exports may reproduce historical patterns in which African economies are structured around the extraction and export of raw materials rather than domestic industrialisation (Gore, 2012; Obi, 2012; Moseley, 2013).

The challenge for African states is therefore not simply whether to engage with China but how to negotiate agreements that promote national development objectives. Without stronger governance frameworks, local processing requirements, and environmental protections, foreign investment may continue to generate limited developmental transformation while external actors capture a significant share of mineral value.

4.3 United States and Western Responses: Supply Chain Security and Strategic Competition

The United States and its allies have increasingly recognised critical minerals as strategic resources linked to economic security and technological competitiveness.

Concerns about dependence on concentrated supply chains, particularly those involving China, have encouraged Western governments to develop alternative mineral partnerships and diversify sources of critical mineral supply. Policies such as the United States' critical minerals strategies reflect broader efforts to secure materials required for renewable energy technologies, semiconductor industries, and defence systems (U.S. Geological Survey [USGS], 2024).

Africa has become increasingly important within these strategies because Western governments view African mineral resources as potential alternatives for strengthening global supply chain resilience. Initiatives promoting partnerships with African countries emphasise transparency, environmental standards, responsible mining practices, and private-sector investments. However, these efforts also raise questions about whether new forms of strategic competition may reproduce older patterns in which Africa's resources serve external industrial priorities.

A contemporary illustration of this strategic competition can be found in South Sudan, where the government is seeking to diversify the economy beyond petroleum by developing its mining sector. Official sources indicate that South Sudan has deposits of gold, copper, zinc, lead, manganese, iron, silver, tin, marble, limestone, and rare earth elements, and recent policy reforms are aimed at attracting investment, strengthening regulation, and promoting value addition (Ministry of Mining, Republic of South Sudan, 2026; SFA Oxford, 2025; African Mining Week, 2026). However, the sector remains underexplored and faces major challenges related to weak governance, limited geological data, and unregulated artisanal mining, which increase the risk of unequal benefit sharing and environmental harm (United States Institute of Peace [USIP], 2013). This makes South Sudan an important example of how critical mineral development in Africa can create opportunities for economic diversification while also raising concerns about transparency, community consent, and sustainable resource governance (Ministry of Mining, Republic of South Sudan, 2026; USIP, 2013).

The "scramble for rare minerals in Kenya" centers on a massive, \$62.4 billion deposit of rare earth elements and niobium at Mrima Hill in Kwale County. These critical minerals are essential for electric vehicles, smartphones, and defense technology. The Geopolitical Race The Players: The United States and China are aggressively competing to secure access to these reserves to control the supply chain for modern electronics and renewable energy. The US Deal: The United States secured a preliminary agreement to develop the Mrima Hill site, with a strict mandate that all strategic minerals must be processed domestically in Kenya to promote localized industrialization. The Current Status: The Kenya-US deal has been challenged in court by local advocacy groups who claim the multibillion-dollar agreement was negotiated in secrecy. Broader Mining Landscape Coltan

Discoveries: Geological surveys have also confirmed significant deposits of columbite and tantalite (coltan) in Embu County, further expanding Kenya's footprint in the critical minerals .

A recent illustration of this geopolitical competition is Kenya's Mrima Hill rare earth project in Kwale County. Geological assessments estimate that the area contains approximately US\$62.4 billion worth of rare earth elements and niobium, minerals that are indispensable for electric vehicles, smartphones, renewable energy technologies, and advanced defence systems. The strategic importance of these deposits has intensified competition between the United States and China as both seek to secure reliable supplies of critical minerals. In response, the United States reached a preliminary agreement to support the development of the Mrima Hill project, with provisions encouraging the domestic processing of strategic minerals within Kenya as part of a broader effort to promote local industrialisation and reduce dependence on overseas refining. However, the agreement has generated controversy, with civil society organisations and local advocacy groups challenging the deal in court, arguing that the negotiations lacked transparency and adequate public consultation. At the same time, geological surveys have confirmed significant deposits of columbite and tantalite (coltan) in Embu County, further strengthening Kenya's strategic position within the emerging global critical minerals economy. These events show that competition between countries for resources is growing beyond traditional mining leaders like the Democratic Republic of Congo and Zambia to include new areas in Africa, leading to important issues about who owns minerals, how communities are involved, how the environment is managed, and how benefits are shared fairly.

A contemporary example of this strategic competition can be observed in Kenya's emerging critical minerals sector. The discovery of significant deposits of rare earth elements and niobium at Mrima Hill in Kwale County has attracted growing international attention because these minerals are essential for electric vehicles, wind turbines, smartphones, semiconductors, and advanced defence technologies. Estimates suggest that the mineral resources at Mrima Hill are valued at approximately US\$62.4 billion, making the site one of East Africa's most strategically significant critical mineral deposits. The growing importance of these resources has intensified competition between the United States and China, both of which seek to strengthen access to secure and diversified mineral supply chains. Reports say that the United States has made a preliminary deal to support the Mrima Hill project and promote the processing of strategic minerals in Kenya to help local industry and lessen reliance on foreign refining. However, the proposed agreement has generated public debate and legal challenges from civil society organisations, which argue that the negotiations lacked transparency and meaningful public participation. At the same time, geological surveys have found valuable deposits of columbite and tantalite (coltan) in Embu

County, which boosts Kenya's role in Africa's growing critical minerals market. These developments illustrate how geopolitical competition increasingly extends into emerging African mineral frontiers and reinforce the importance of transparent governance, environmental protection, and equitable community participation in mineral development (Hund et al., 2025; Sovacool et al., 2020; Bridge, 2004).

Political ecology perspectives highlight that global resource competition is rarely neutral because powerful actors often possess greater economic and political influence over resource decisions (Robbins, 2012). While Western approaches frequently emphasise governance standards and responsible investment, African policymakers have argued that external partnerships must move beyond securing mineral access to supporting industrial development, technology transfer, and local economic transformation.

The central issue is therefore whether international competition over critical minerals will create opportunities for African industrialisation or continue a pattern in which the continent supplies raw materials to external economic systems. Achieving sustainable outcomes requires African states to negotiate from positions of greater institutional capacity and strategic coordination.

4.4 Beyond Resource Extraction: The Need for African Mineral Sovereignty and Value Addition

A major challenge facing African mineral economies is the continued dependence on the export of unprocessed raw materials. Historically, many African countries have occupied lower-value positions within global commodity chains, exporting minerals while importing finished products made from those same resources. This structure limits industrial development, reduces employment opportunities, and weakens economic sovereignty (Nkrumah, 1965; Watts, 2009; Rodney, 1972; Obafemi, 2023).

The critical mineral transition provides an opportunity for African countries to challenge this pattern by developing local processing industries and increasing participation in global value chains. Mineral beneficiation—the transformation of raw materials into processed products—can generate higher economic returns, create skilled employment, and support industrial development. For example, rather than exporting cobalt ore, African countries could develop processing capabilities linked to battery manufacturing and renewable energy industries.

However, achieving mineral sovereignty requires significant investments in infrastructure, education, technology, research capacity, and governance institutions. It also requires cooperation among African states to avoid competing individually for foreign investment under unequal conditions. Regional approaches through institutions such as the African Union and African Continental Free Trade Area (AfCFTA)

provide opportunities for developing coordinated mineral strategies and strengthening Africa's negotiating position.

African agency is therefore central to the future of mineral governance. Rather than being passive locations where global powers compete for resources, African states and communities must shape the terms under which minerals are extracted, processed, and distributed.

4.5 Environmental Governance and the Protection of Community Rights

The expansion of critical mineral extraction requires stronger environmental governance frameworks to prevent ecological damage and social injustice. Mining regulations must address issues including pollution control, biodiversity protection, land rights, water management, and rehabilitation of mining sites. Weak regulatory systems can allow corporations to externalise environmental costs onto local communities while maximising economic benefits for investors.

Environmental justice scholarship emphasises that sustainable resource governance requires meaningful participation from the affected communities. Communities living near mining areas should have access to information, participate in decision-making processes, and receive fair compensation where extraction affects their livelihoods (Schlosberg, 2007). This approach challenges models of development where governments and corporations make decisions without adequate consultation with local populations.

Indigenous and customary land rights are particularly important in mineral governance. Many African communities maintain historical, cultural, and spiritual relationships with land that extend beyond economic ownership. Mining projects that disregard these relationships risk causing cultural disruption alongside environmental harm. An eco-humanities perspective, therefore, argues that mineral governance must recognise landscapes as cultural and ecological spaces rather than simply as economic territories (Nixon, 2011).

Strengthening environmental governance also requires transparent mining contracts, independent environmental impact assessments, anti-corruption measures, and accountability mechanisms. These measures are necessary to ensure that mineral wealth contributes to sustainable development rather than deepening inequality.

3.6 Kenya's Emerging Critical Minerals Sector: Rare Earth Elements, Niobium, and Coltan

Kenya is emerging as an important participant in Africa's critical minerals landscape following the discovery of commercially significant deposits of rare earth elements, niobium, and coltan. Unlike the long-established mining economies of the Democratic Republic of Congo, Zambia, Zimbabwe, and Mozambique, Kenya represents a new frontier in the

global race for minerals required for renewable energy technologies, electric vehicles, digital infrastructure, and advanced defence systems. These discoveries demonstrate that the geography of critical mineral competition is expanding across the African continent, drawing increasing attention from major global powers seeking to diversify supply chains (Hund et al., 2025).

The most significant discovery is located at Mrima Hill in Kwale County, where geological assessments indicate substantial deposits of rare earth elements and niobium. These minerals are indispensable components in the manufacture of permanent magnets, electric vehicle batteries, wind turbines, smartphones, semiconductors, aerospace equipment, and military technologies. The estimated value of the deposit, reported at approximately US\$62.4 billion, has transformed Mrima Hill into one of East Africa's most strategically important mineral prospects. The economic significance of the deposit has intensified international interest in Kenya's mining sector, particularly from the United States and China, whose strategic rivalry increasingly extends beyond traditional mining regions.

Kenya has also recorded significant discoveries of columbite and tantalite (coltan) in Embu County, further strengthening the country's position within Africa's emerging critical minerals economy. Coltan is an essential raw material in the production of capacitors used in smartphones, computers, electric vehicles, and other electronic devices. These discoveries diversify Kenya's mineral portfolio and increase its geopolitical relevance as demand for critical minerals continues to expand globally (Sovacool et al., 2020).

From an environmental justice perspective, the rapid development of Kenya's critical mineral sector presents opportunities as well as significant governance challenges. Mining projects may stimulate investment, employment creation, infrastructure development, and industrialisation; however, they also raise concerns regarding land acquisition, environmental degradation, biodiversity conservation, water resource management, and the protection of community livelihoods. Communities surrounding prospective mining areas have expressed concerns about transparency, public participation, and equitable benefit-sharing, reflecting broader debates over procedural justice in Africa's extractive industries. Environmental justice scholars argue that communities should participate meaningfully in decisions affecting their lands and natural resources rather than merely receiving compensation after agreements have been concluded.

The Kenyan experience also demonstrates the growing connection between critical minerals and geopolitical competition. Reports indicate that the United States has pursued cooperation with Kenya on developing the Mrima Hill project while encouraging domestic processing of strategic minerals to promote local value addition and industrial development. However, these initiatives have generated legal and public controversy, with civil society organisations challenging aspects of the negotiations on the grounds of

transparency and public accountability. These developments show that the global race for important minerals is not just about getting raw materials anymore; it also includes issues like governance, processing, environmental care, and a country's control over its minerals (Bridge, 2004).

From an eco-humanities perspective, the emerging mining sector in Kenya highlights the importance of recognising landscapes not merely as repositories of economically valuable minerals but also as environments that possess ecological, historical, cultural, and social significance. Sustainable mineral governance, therefore, requires balancing economic development with environmental stewardship, protection of biodiversity, respect for local communities, and recognition of indigenous knowledge systems. Kenya's experience reinforces the broader argument of this study that Africa's critical mineral future should be guided by principles of environmental justice, community participation, and equitable resource governance rather than geopolitical competition alone.

4.7 Towards Community-Centred and Sustainable Mineral Governance

The future of Africa's mineral sector depends on moving beyond competition among external powers toward governance models centred on African priorities and community wellbeing. China–United States rivalry may provide opportunities for African countries to attract investment and negotiate improved partnerships; however, these opportunities will only produce meaningful development outcomes if African institutions establish clear strategies for resource management.

A community-centred approach requires recognising local populations as stakeholders rather than as victims of extraction. This involves ensuring community participation in mining decisions, protecting cultural heritage, supporting local economic development, and ensuring that mining revenues contribute to public welfare. Sustainable mineral governance must therefore balance economic objectives with ecological protection and social justice.

The concept of a just mineral transition extends the idea of climate justice by recognising that the transition away from fossil fuels should not create new forms of environmental inequality. As Sovacool et al. (2020) argue, sustainable energy transitions must consider the social and environmental consequences of mineral production. A truly sustainable transition requires accountability throughout the entire supply chain, from extraction sites in Africa to technological industries in global markets.

4.8 Conclusion

The strategic competition between China and the United States over Africa's critical minerals represents a significant transformation in global resource politics. Critical minerals have become instruments of geopolitical

influence, technological competition, and economic security. While foreign investment from China, the United States, and other global actors can provide infrastructure, capital, and market opportunities, it can also reinforce historical patterns of extraction if African countries remain dependent on raw mineral exports.

The future of Africa's mineral governance depends on strengthening African agency, promoting local value addition, protecting environmental rights, and ensuring community participation. Rather than serving merely as suppliers within global mineral chains, African countries must pursue strategies that transform mineral wealth into sustainable development. This requires transparent governance, stronger environmental institutions, recognition of indigenous rights, and partnerships that prioritise long-term social and ecological wellbeing.

5. CONCLUSION

This study examined the implications of the China–United States strategic rivalry over Africa's critical minerals through the perspectives of environmental justice, political ecology, and eco-humanities. It demonstrated that the global competition for cobalt, lithium, copper, graphite, and other strategic resources is not only a geopolitical and economic issue but also a social, ecological, and ethical challenge. The analysis revealed that while critical minerals provide opportunities for industrialisation, renewable energy development, and economic transformation, their extraction has also generated significant consequences for African communities, including environmental degradation, displacement, livelihood disruption, and threats to cultural landscapes.

In addressing the first research objective, the study examined how China–United States competition over African critical minerals affects local communities and ecosystems. The findings show that both geopolitical and economic interests shape mineral governance in Africa, with external powers seeking secure access to resources while local communities often experience the environmental and social consequences of extraction. The cases of cobalt mining in the Democratic Republic of Congo, lithium extraction in Zimbabwe and Namibia, copper mining in Zambia, and graphite mining in Mozambique demonstrate that mineral competition can reinforce unequal relationships when African communities have limited participation in decision-making.

Regarding the second research objective, the study analysed the environmental justice challenges associated with critical mineral extraction. It found that mining activities frequently produce unequal distributions of environmental risks and economic benefits. Pollution, land degradation, displacement, unsafe labour conditions, and the marginalisation of indigenous and local voices remain major concerns. These challenges demonstrate the transition toward renewable energy.

These challenges emphasise the necessity of stronger commitments to environmental protection, social justice, and community rights alongside the transition to renewable energy. This transition requires stronger commitments to environmental protection, social justice, and community rights.

In relation to the third research objective, the study explored how eco-humanities perspectives can contribute to more sustainable and ethical mineral governance. The findings highlight that minerals should not be viewed only as economic commodities but as resources embedded within cultural, historical, and ecological relationships. Recognising indigenous knowledge systems, protecting cultural landscapes, and involving communities in resource decisions are essential for developing a more sustainable mineral future.

The study therefore argues that Africa's critical mineral future requires a shift from extractive governance toward a justice-based model that balances economic development with environmental sustainability and social inclusion. African countries must strengthen mineral sovereignty through local value addition, transparent partnerships, stronger environmental regulations, and protection of indigenous and community rights. Rather than becoming passive participants in global resource competition, African states and communities should play active roles in shaping mineral governance and determining how resource wealth contributes to long-term development.

Ultimately, the China–United States rivalry over Africa's critical minerals should be understood not only as a competition for strategic resources but also as a test of global environmental ethics. A sustainable mineral transition must recognise the dignity of affected communities, respect ecological systems, and ensure that the benefits of the green economy are shared more equitably.

The emerging critical minerals sector in Kenya further illustrates that geopolitical competition is expanding into new regions of Africa beyond the continent's traditional mining economies. This development reinforces the need for transparent mineral governance, local value addition, environmental protection, and meaningful community participation as essential foundations for sustainable resource development.

5.1 Contribution of the Study

This study contributes to scholarship by:

1. **Expanding critical mineral debates beyond geopolitical and economic perspectives** by incorporating environmental, cultural, and ethical dimensions.
2. **Highlighting environmental justice challenges in African mining communities** by examining the unequal distribution of ecological risks and economic benefits.

3. **Integrating indigenous knowledge and cultural heritage into sustainability debates** by demonstrating the importance of community relationships with land and ecosystems.

4. **Advocating for African-centred mineral governance** through local processing, stronger regulation, and greater community participation.

5. **The goal is to provide an ethical framework for global mineral competition** that prioritises environmental responsibility, human rights, and long-term ecological sustainability.

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