



MARTIAL MINING

resisting extractivism
and war together

Acknowledgements

London Mining Network (LMN) is an alliance of human rights, development, environmental and solidarity groups.

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EXECUTIVE SUMMARY

At a time of global health, climate and ecological crises, nation-states around the world are spending over \$1.9 trillion a year on war, almost \$5bn a day.¹ The UK's Ministry of Defence (MOD) is scheduled to procure a new generation of military hardware worth up to £350 billion.²

Militarism is more than a deadly diversion of funds from the health of people and the planet towards warfare. It is an essential ingredient fuelling the climate and ecological crises. The United States' military is the world's single largest polluter.³ The UK's military-industrial sector has a carbon footprint of at least 11 million tonnes a year, more than 60 individual countries like Madagascar and Zambia.⁴

Fundamentally, extractivism is a militarised process: it violently ruptures ecosystems and habitats. In doing so, it displaces then polices human communities with ongoing connections to the land. Relatedly, **militarism is an extractive process:** it depends on vast quantities of natural resources to innovate and assemble more deadly technologies of control and destruction. This is the organising principle of **martial mining**.

MILITARISED MINING

Continuing four centuries of European conquest and settlement in the Americas, Africa, Asia and Australia, London's mining giants Anglo American, BHP, Rio Tinto and Glencore emerged and transformed into multi-billion dollar transnational corporations over the last hundred years.

Mining operations are often confronted by resistance. But community resistance is often met with repression, from intimidation, surveillance and harassment to forced disappearances, invasions and assassinations. London's mining giants are involved in at least 83 cases of conflict surrounding extractive operations.⁶

Mining companies apply various counterinsurgency tactics to maintain extractive legitimacy, like sponsoring schools and hospitals, or using environmental initiatives to rebrand and 'greenwash' ecological and social harm.

Mining companies tend to conceal or downplay the role their minerals play in the arms trade, preferring to emphasise their contribution to more socially useful products. But without minerals—from metals to rare earth elements and other by-products—there would be no weapons for war.⁵



MATERIAL MILITARIES

Arms companies require large volumes of natural resources to be extracted from the earth in order to produce weapons and technologies for war. They admit only limited knowledge of the volume of materials they consume due to security restrictions, vast global supply chains, and multiple end-use applications which blur any distinction between military and civilian sectors.

The MOD's next generation of military hardware assembles at least 514,270 tonnes of raw materials. Scaling up the resources consumed by the UK military—which represents 2.5% of global military spending—would suggest a minimum demand of 20.6 million tonnes of minerals to re-equip the world's armies over the coming decade, inevitably leading to billions of tonnes of toxic waste in the extraction process.

Global military powers, like the UK, frame climate change as a security issue. This roots concerns in questions of operability and expands rather than reduces their spheres of activity, from the melting Arctic to frontiers of space.⁷

Military greenwashing is increasing, with the arms industry developing 'environmentally friendly weapons'—from lithium-ion battery tanks to solar-powered drones—and nature conservation serving as a pretext for military intervention.



EXTRACTIVE WARFARE

All stages of warfare generate significant ecological consequences alongside human catastrophe, including resource consumption and stockpiling, water, air and land pollution, destroyed habitats and infrastructures, and escalating carbon emissions. British armed forces are committed to over 30 operations in at least 25 countries,⁸ including covert wars in Afghanistan, Iraq, Libya, Pakistan, Somalia, Syria, and Yemen.⁹



Up to 6% of the earth's land mass is used for military training, including weapons and explosives testing, and using toxic chemicals to maintain and service equipment.¹⁰ Britain has an extensive network of at least 32 overseas garrisons from Belize to Brunei, Kenya to Oman.¹¹

The UK is the world's second largest arms exporter and fourth highest trader in security and surveillance equipment.¹² The MOD emphasises that the purpose of military exports and engagements is to "assure the UK's access to secure and affordable resources."¹³

REVOLVING DOORS

The Defence Board, the highest committee in the MOD, includes high-profile mining executives. The chair of the Defence Equipment and Support Board is a former chairman of Rio Tinto and chief executive at Shell, while a current Rio Tinto board member chairs the Defence Audit Committee.

There are numerous corporate executives who sit on the boards of both arms and mining companies, with regular movement between them, sharing expertise and connections.

Mining and arms companies share a significant number of major shareholders, mostly via fund management companies like Blackrock and Legal & General.

INTRODUCTION

The status quo was already an emergency. Climate change, global warming, and biodiversity loss are escalating symptoms of the sixth mass extinction event in the earth's planetary history.¹ The coronavirus pandemic has only intensified the urgency of this catastrophe for many communities around the world.

Like pandemics, climate and ecological crises are not simply calamities arising from natural or biological causes, but unfolding social disasters. Moreover, under a global political and economic system shaped by centuries of empire and colonialism, neither unfold equally.² Rather, their impacts are distributed differentially across lines of race, class, gender, disability, immigration status, and other structures of oppression.

From the perspective of most nation-states, these existential threats are another 'security' concern, reflected in annual global military expenditures of \$1.9 trillion, almost \$5 billion a day.³ For example, the United Kingdom's (UK) National Security Strategy describes climate change as "potentially the greatest challenge to global stability and security."⁴

Although climate change and global health pandemics are untroubled by military might, the Ministry of Defence (MOD) is scheduled to spend up to £350 billion on a new generation of nuclear submarines, aircraft fighters and carriers, combat ships, armoured vehicles, drones and satellites over the coming decades.⁵

However, **militarism is more than a deadly diversion of funds from the health of people and the planet towards warfare. It is an essential ingredient fuelling the climate and ecological crises.** Most obviously, the United States' (US) military consistently ranks as the world's most prolific polluter.⁶ Despite this, the military remains exempt from international climate agreements and monitoring.⁷

This report highlights an often overlooked entanglement between militarism and climate catastrophe: **the vast quantities of natural resources required to assemble weapons for war, and the even larger volume of toxic waste left in the wake of their extraction.**

Travelling from mines to smelters and factories, materials like aluminium, copper, platinum, cobalt and rare earth elements are transformed into technologies of violence and destruction. These technologies return to the communities where those minerals are torn from the earth in militarised mining operations.

As both a hub for arms and security companies and key marketplace for fossil fuels, metals and minerals on the main stock exchange and secondary Alternative Investment Market, this report highlights **London's role (and that of the UK more broadly) as a global capital for organised violence that irreducibly entangles mining with warfare around the world.**

KEY TERMS

Extractivism a worldview rooted in colonialism which holds that humans are separate from, and superior to, the rest of the living world. Accordingly, it transforms populations, plants and animals, land and water, and histories, habitats and social relations into commodities for capital accumulation.⁸ This relies on the dispossession and displacement of local communities, mainly in the Global South, to exploit raw materials for profit, mostly by corporations in the Global North.⁹

Militarism a structure that complicates traditional distinctions between military and civilian forms of government. It emphasises the central role warfare plays in the making of the contemporary global system, including through imperial conquest and chattel slavery, colonial settlement and occupation, policing and incarceration, and resource extraction and ecological destruction.¹⁰

An aerial view of the London Stock Exchange at Paternoster Square
Source: Getty Images



COLONIAL MINES AND MILITARY EMPIRES: ORIGINS OF LONDON'S MINING GIANTS

London's mining giants often portray themselves as benign technological institutions, heralding the arrival of modernity and spread of progress. But tracing the roots of these companies—including BHP, Anglo American and Rio Tinto, all incorporated for at least a century—and their transformation into multi-billion-dollar transnational corporations, fundamentally unsettles this narrative. Instead, what is revealed is an ongoing process of capital accumulation structurally dependent on colonial and imperial warfare, and cumulative harm to people and nature.

As mining and metallurgy have been practised across civilisations for millennia,¹ no fixed origin for their entanglements with militarism is claimed here. However, it is now beyond reasonable doubt that European conquest, settlement and empire have irrevocably altered global landscapes and atmospheres over the last five centuries. Accordingly, some histories of contemporary climate and ecological crises begin in fourteenth century Europe, where famine and bubonic plague wiped out up to half of the population, and rulers of England and France fought the longest military conflict in continental history for over a hundred years.²

Alongside the proliferation of weapons and creation of standing armies, the resulting demographic collapse ruptured the class arrangement of feudal society, which relied on lords' control of land and growing peasant production.³ Popular unrest, including the 1381 Peasants' Revolt, as well as demands for tax relief and restoring common land rights, were intolerable to Europe's ruling classes. Instead, they expanded tools of repression and exploitation by exaggerating the peasantry's regional and cultural differences into dehumanising 'racial' ones that were used to justify the persecution of Irish, Jewish, Roma



Elmina Castle in Ghana, the oldest European building south of the Sahara, built in 1482, which became a fort for trafficking enslaved Africans. Various flags are visible on docked boats, including Ghanaian, Dutch and German
Photograph by David Ley

and Sinti, and immigrant worker communities in Europe.⁴

As economic surplus continued to shrink while war debts mounted, colonial frontiers became the “organising principle of metropolitan wealth.”⁵ Centuries of conflict on the Iberian peninsula remade the aristocracies of Portugal and Castile, prompting expeditions to the coasts of west Africa in 1441 and—following the completion of the Reconquista and expulsion of Muslims and Jews from the peninsula— invasions of the shores of the Americas in 1492.⁶

Transfers of pathogens, evictions from lands, and enslavement on plantations and mines forcibly directed the continent's 60 million Indigenous people towards extermination. By 1610, only one in ten survived, marking the largest human mortality event in proportion to population in global history. **When nature reclaimed formerly cultivated land, leading to increased carbon sequestration, these genocides cooled the planet and registered geologically with a ‘little Ice Age.’**⁷

To meet the colonies' demands for labour, one holocaust mobilised another: the kidnapping and trafficking of at least 12.5 million enslaved Africans to the Americas. Millions would die in mines, on plantations, and from the afterlives of pollution.⁸

As European empires fought colonial wars of occupation, as well as each other in competition for the spoils of conquest, a “military revolution” was occurring on the continent. The size of its armies grew ten-fold between 1530 and 1710.⁹

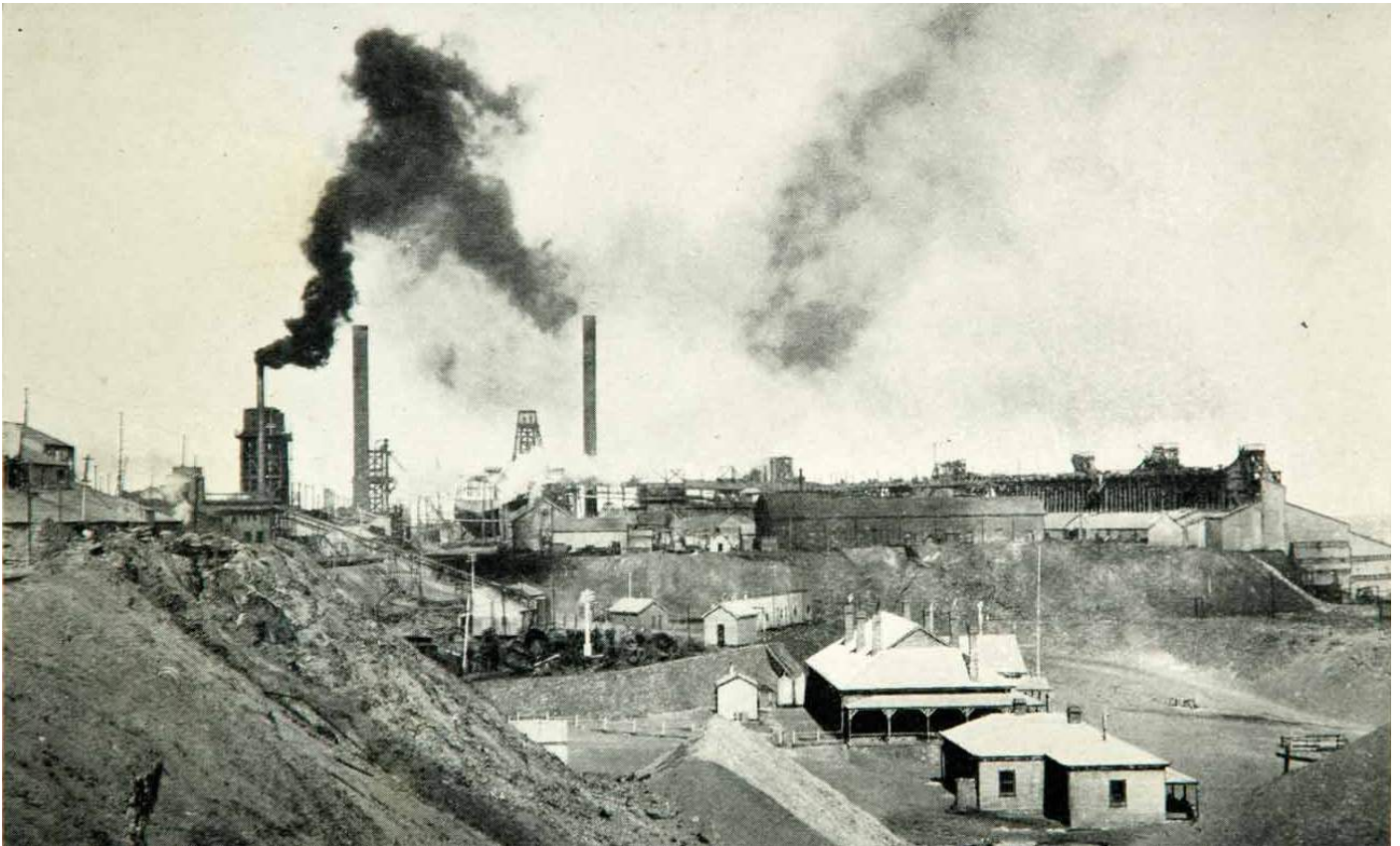


Engraving from book by Theodor de Bry of Indigenous peoples forced to labour in the silver mines of Potosí in the sixteenth century Source: North Wind Pictures

Permanent war made industrial revolution both “necessary and possible.”¹⁰ The demands of larger armies gradually transformed manufacturing capacities, including assembly lines and interchangeable parts, and introduced new commodity circulations between guns, metals, coins, and enslaved people. By the second half of the eighteenth century, up to 200,000 British guns were being dumped in Africa every year in return for captive exports, with millions more being sold across India, the Caribbean, and the Americas.¹¹ Thereafter, guns became “instruments of civilisation and conflict,” expanding and protecting private property, and Britain became the new “global arms depot.”¹²

Invariably, the accumulation and consumption of massive quantities of raw materials—gold dust, silver wire, rolled copper and smelted iron—was essential to mass production.¹³ Across Peru and Bolivia, the mines of Potosí provided European metropolises with 136,000 tonnes of silver over three centuries, covering at least 80% of global trade in the precious metal.¹⁴

Resistance to enslavement and ecological destruction was constant.¹⁵ Yet when the British parliament proclaimed the abolition of slavery in 1833, it expended an enormous ‘compensation’ package to slave-owners for their “loss of property.” Equivalent to £300 billion today, this loan was still being repaid by British taxpayers until 2015.¹⁶ It also made a new generation of imperial infrastructures and colonial enterprises possible, including railways from London to Birmingham—the home of gun manufacturing—and mining companies from Potosí to Jamaica to Australia.¹⁷



Original 1910 black and white halftone print that depicts the mines at Broken Hill *Photograph by the Agent-General for New South Wales*

Britain's bailout for slave-owners directly accelerated the colonial settlement of Australia, with new mayors, governors, and founders of banks and universities all mobilising their compensated 'property' to appropriate land from its original inhabitants for white possession.¹⁸ In the wake of frontier invasions and at least five hundred massacres across the continent, a German officer Charles Rasp deserted the Franco-Prussian war before assembling a syndicate of investors to incorporate the Broken Hill Proprietary (BHP) in New South Wales in 1885 to develop its vast deposits of silver, lead and zinc.¹⁹

Carvings in Broken Hill reveal that the region's original inhabitants can trace 45,000 years of ancestry on the land. However, industrial mining destroyed sacred sites and continues to deprive them of the mobility required for traditional modes of existence.²⁰ BHP is currently "poised to destroy up to 86 significant Aboriginal sites" in order to expand iron ore mining operations in the

Pilbara region. This ongoing "spiritual and physical harm" is being resisted by the land's owners, the Banjima people.²¹

Under the leadership of Essington Lewis, BHP diversified its business through global warfare. As chairman, Lewis formed a coalition that led Australia's production of munitions and aircraft during the Second World War, where their Imperial Forces trained and fought in Palestine, Egypt, Syria, Papua New Guinea and Malaya, among others.²² Established as an industrial giant, BHP transformed into a global minerals enterprise operating across six continents through a series of mergers and acquisitions, most notably with Billiton, a company that originated in 1860 on an island in the Indonesian archipelago under Dutch occupation, which surpassed Cornwall as the world's largest producer of tin.



The discovery of the world's largest gold deposits on a farm in Transvaal prompted a deadly rush and prolonged conflict between British and Boer settlers Source: *Hulton Archive/Getty Images*

Southern Africa's importance to the British empire intensified after the discovery of enormous deposits of gold and diamonds at the end of the nineteenth century. Competing settler interests, which culminated in two ferocious Anglo-Boer wars, eventually reconciled in the construction of a unified state in 1910 "firmly focused on the needs of the mining industry."²³ The vast majority of land was appropriated exclusively for white occupation, while dispossessed Africans were crowded into reservations that would provide supplies of cheap labour for mines, plantations, factories, and homes.²⁴

Founded in 1917 in Johannesburg, Anglo American is a product of this race war. The gold mining company expanded rapidly, becoming a major stakeholder in and partnering with Cecil Rhodes' De Beers' diamonds grab and the British South African Company, both at the forefront of colonial resource extraction and settler terrorism.²⁵ It also joined forces with Nobel—infamous manufacturer of dynamite—to create the African Explosives & Chemical Industries.²⁶

When a mandated system of racial segregation was introduced in 1948, known as apartheid, Britain refused calls for international sanctions for decades because it recognised that "important sections of British industry could be ruined" without the supply of South Africa's raw materials.²⁷ Even after reluctantly agreeing to an arms embargo, South Africa's Armaments Corporation reveals that at least 87 contracts with UK companies violated those sanctions.²⁸ In fact, mining company Lonrho, later Lonmin, was directly involved in supplying weapons and components.²⁹

Anglo American controlled up to half of all private industry in South Africa when apartheid fell in 1994. The National Union of Mineworkers estimates that 46,000 people had died in South Africa's gold mines since the beginning of the century.³⁰ This fatal accumulation transformed Anglo American into a global mining company, operating across six continents.

Rio Tinto

In 1873, Deutsche Bank and Matheson & Co—a London-based trading house smuggling opium, tea and cotton from Hong Kong and Calcutta—formed a syndicate to buy the Rio Tinto mines in Spain. They transformed an operation that once supplied ancient Greece and Rome into one of the world's premier copper producers.³¹

Rio Tinto's trajectory was shaped by chairman Auckland Geddes. After serving in the second Anglo-Boer war, then as director of recruitment in the War Office during the First World War, and, in the post-war cabinet, as Minister of Reconstruction and President of the Trade Board, Geddes became Rio Tinto's spearhead in 1924. Driving the company's business into the Zambian copperbelt, Geddes continued as chairman until 1947, while also acting as Britain's commissioner for civil defence during the Second World War.³²

Rio Tinto became even more integral to British militarism by leading a cartel of mining interests that would service the development of the country's nuclear arsenal. Occupied by apartheid South Africa and operated by Rio Tinto, Rössing uranium mine in Namibia was "as close as the UK would come to controlling its own uranium supply." The company signed two contracts with the UK Atomic Energy Authority in 1968 for 7,500 tonnes of processed uranium, known as 'yellowcake'.³³

During the 1970s, Rio Tinto accounted for as much as a quarter of global uranium production.³⁴ When the United Nations prohibited the extraction of natural resources from Namibia, Rio Tinto's chairman Val Duncan (who served in the Second World War on the staffs of several American generals) declared the company was "not prepared to take any notice," and the British government formally rejected the decree.³⁵ Rössing became an "emblem of colonialism" for the Namibian liberation movement, helping to forge alliances between the international anti-apartheid and nuclear disarmament movements.³⁶



The Rio Tinto, or 'stained river,' in southwestern Spain, following thousands of years of copper mining using acids and sulphides Source: Cat Gaa

Many of the world's atomic weapons originate in African mines. The uranium for the Hiroshima and Nagasaki bombs, for example, came from Shinkolobwe in the Congo, then under Belgian colonial rule.³⁷ In the nuclear arms race that followed, Britain exploded seven tests and 700 subtests between 1956 and 1963 on Aboriginal land in southern Australia, forcibly resettling many in the process.³⁸ Nuclear war continues today through regular weapons testing, spreading radioactive contaminants and incinerating sacred lands from the Marshall Islands to Western Shoshone territory in Nevada.³⁹

The second atomic bomb test at Bikini Atoll on the Marshall Islands, July 25, 1946
Source: AP



MILITARISED MINING

Without minerals, there would be no weapons. Without military hardware and strategies, corporate control over land—and the communities that live and depend on it—would be impossible to maintain. Yet, despite this interdependence, mining and arms companies give the overwhelming impression that they operate entirely separately from one another.

Mining companies tend to conceal or downplay the role their minerals play in the arms trade, preferring to emphasise their contribution to more socially useful products. The manufacturers and traders of those weapons, meanwhile, admit only a limited knowledge of the volume of materials they consume.¹ Explanations include vast supply chains and multiple end-use applications which blur the distinction between military and civilian sectors. Data is also regularly restricted by confidentiality for commercial and security purposes.²

However, a European Commission policy report—with input from arms contractors Rolls-Royce, Airbus and Thales—outlines **39 raw materials and 47 specialised processed materials essential to the production of military equipment.** Over half of these minerals are sourced entirely from outside Europe. The most important suppliers receive an honourable mention: Anglo American, Glencore and Rio Tinto.³

Before being manufactured and deployed on battlefields, raw material extraction for weapons production causes varying degrees of pollution and harm. The United Nations estimates that **extractive industries are responsible for over 80% of ecosystem destruction, 85% of water stress and half of global greenhouse emissions.**⁴

Usable metals are generally a fraction of the total mass of ore extracted from the earth. Often using cyanide, mercury and arsenic, enormous volumes of toxic waste are generated in their separation, running straight into local water sources or contained in massive dams.⁵ There are

over 3,500 of these ‘tailings dams’ around the world, with 687 at ‘high risk’ of failure.⁶ Recent collapses in Brazil in Mariana and Brumadinho killed at least 19 and 272 people respectively, displacing thousands more and contaminating hundreds of miles of rivers.⁷ After climate change, acid mine drainage is regarded as the most significant ecological problem facing the world.⁸

At the other end of the supply chain, the UN estimates a record 54 million tonnes of e-waste containing copper, gold, silver, platinum and other materials were dumped by consumers in 2019, mostly from Europe and north America, releasing more toxic metals into soils and oceans.⁹

Mining operations—and attendant ecological destruction—are often confronted by resistance. But community resistance is frequently met with repression, from intimidation, surveillance and harassment to forced disappearances, invasions and assassinations.

The Environment Justice Atlas registers at least 3,212 conflicts surrounding ongoing extractive operations or as a result of their legacies, with London’s mining giants recorded as responsible for 83.¹⁰ Private military and security companies like Aegis and G4S explicitly target the natural resources sector in “high risk and complex environments” for profit-making.¹¹ On average, four land and environmental defenders have been killed every week since the Paris Climate agreement was signed in 2015.¹²

The following section of this report highlights five cases of militarised mining operations and profiles key minerals that feed into the production of military hardware.

WHAT DO THE COMPANIES SAY?

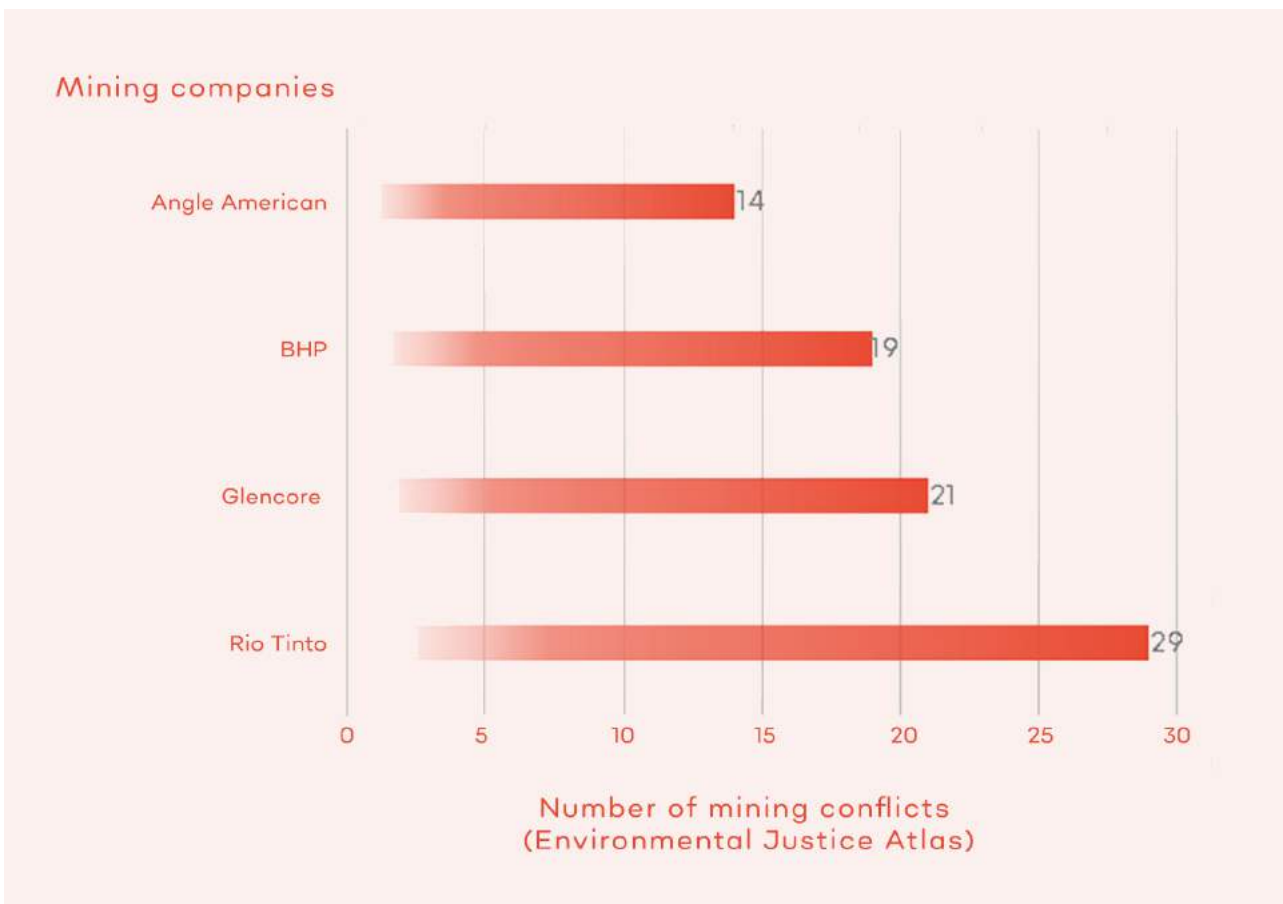
Anglo American – metals and minerals are “ultimately used in the manufacture of many different industrial and consumer products...from smartphones to wind turbines,” as well as providing the “foundation for much of the world’s basic infrastructure and transportation.”

“We generally sell our raw materials to the next stage on the value chain—industrial users and fabricators, such as steel mills, copper refiners, but also to automotive companies...**We are not in a position to determine to what extent “our” raw materials might end up in the defence or any other industry,** as that is several steps along the value chain from our sale of those products” (via email 22/06/20)

Antofagasta – all copper is sold to smelting companies and fabricators and “used in a wide range of industries and applications.” Ultimately, the company is “**not aware of where the final products are used**” (via email 28/05/20)

Glencore – after several emails and phone calls, where Glencore’s media spokesperson asked for access to the responses by other mining companies on the report, the company decided not to provide any comment.

BHP and **Rio Tinto** were both approached for comment on several occasions, but neither company responded to questions about the end-use of their mineral resources in arms production.



MINERAL PROFILE: ALUMINIUM

Aluminium metal is smelted from alumina, which in turn is extracted from bauxite ore, the most abundant metal on earth

Properties: lightweight, resistant to corrosion, malleable, recyclable

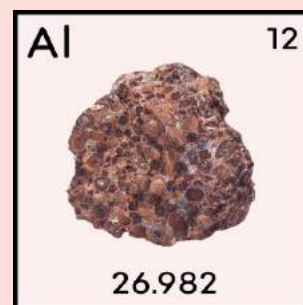
Typical waste: 1 tonne aluminium = 4 tonnes bauxite ore¹³

Based in London: International Aluminium Institute represents over 60% of global production. Aluminium Committee on London Metals Exchange, which includes military aerospace manufacturer Arconic, the company responsible for the cladding on Grenfell Tower¹⁴

Military applications: 26% is consumed by the aerospace, automobile and aeronautical sectors, including in the manufacture of fighter aircraft, helicopters, frigates, destroyers and submarines. 11% is used in electrical engineering, such as electro-optical systems and navigation radars for military weaponry. Another 11% is applied in industrial machinery and equipment like torpedoes, missiles, assault rifles and other firearms¹⁵

UK-listed companies (annual production volume aluminium/alumina):

- **Rio Tinto** (3,171,000 tonnes): significant stakes in 5 bauxite mines in Guinea, Brazil and Australia; 14 smelters across Canada, Australia, New Zealand, Iceland and Oman; 4 refineries; 7 hydropower plants; and 2 port and rail facilities¹⁶
- **South 32** (982,000 tonnes/5,050,000 tonnes): bauxite mines in Australia and Brazil; 2 smelters in South Africa and 1 in Mozambique¹⁷
- **Glencore** (11,000,000 tonnes sold):¹⁸ 10.55% stake in En+ Group (also listed on London Stock Exchange and registered in Jersey).¹⁹ En+ Group holds 57% stake in Rusal which operates 7 bauxite mines (Russia, Guyana, Jamaica, 3 in Guinea), 10 refineries (Russia, Guinea, Australia, Italy, Ireland, Jamaica, Ukraine), and 8 smelters (Sweden, Nigeria, 6 in Russia)²⁰



Aerial view of Sangarédi bauxite mine, jointly operated by the Guinean government and a consortium of transnational companies including Rio Tinto. Guinea is the second largest bauxite producer in the world **Source: Dynamic Mining**



CASE STUDY: GLENCORE IN THE CONGO



Villagers and children in the eastern Democratic Republic of Congo (DRC) watch as an armoured vehicle with four United Nations peacekeeping soldiers rolls past Source: MONUSCO (United Nations Organization Stabilization Mission in the DR Congo), January 2013

Over half of the world's cobalt reserves are in the Democratic Republic of Congo (DRC),²¹ alongside huge quantities of copper, gold, tantalum, diamonds, uranium and oil. Colonial and military violence has long been essential to their extraction.

Vast rubber plantations and a holocaust of over 10 million people under Belgian occupation transformed the Congo into Africa's most profitable colony.²² Independence remained illusory after the secret services from Britain, the US and Belgium collaborated to assassinate the democratically elected anti-imperialist leader Patrice Lumumba and usher in three decades of rule by military general Mobutu Sese Soko.²³ By the end of the century, Congo was the epicentre of the world's deadliest conflict since 1945, involving at least seven African countries and 5.4 million deaths.²⁴

Glencore is a primary beneficiary of this militarised legacy of resource extraction through its subsidiary Katanga Mining, listed in Toronto since 1997 though taken private by the company in 2020. Katanga Mining profits

from two majority-owned ventures with Gécamines, the DRC's state mining company: Kamoto Copper Company and DRC Copper & Cobalt.²⁵

While market prices rise due to demand for battery technologies, numerous human rights abuses are known to "power the global trade in cobalt."²⁶ At least 35,000 children as young as six are working in criminally unsafe conditions in artisanal mines.²⁷ Underground tunnels caved at Glencore's Kamoto mine in 2019, leading to the deaths of 43 people.²⁸ Industrial pollution of rivers, air and soils contributes to chronic illnesses for communities surrounding mining operations.²⁹

Home demolitions, evictions and displacement, as well as targeted violence against activists and land defenders, are commonplace. Glencore's subsidiaries have employed numerous private security companies, including some managed by former apartheid South African soldiers from units guilty of serious rights violations in Namibia and Angola.³⁰

To stabilise conditions for resource extraction, the British army provides training to Malawian and Zambian battalions before their deployment to UN peacekeeping operations (MONUSCO) in the DRC (as well as the Central African Republic),³¹ which have been marred by allegations of sexual abuse, including of children, since they began in 1999.³²

MONUSCO is mandated to establish trading centres for coltan and gold, train significant numbers of “mining police,” and “extend state authority into mining sites” despite repeated

incidents of Congolese army units exploiting the minerals themselves.³³

Glencore is also embroiled in corruption scandals in the DRC after paying £75 million to Israeli billionaire Dan Gertler, who is accused of bribing senior officials in Gécamines to secure mining agreements. Over just three years, cut-price mining licenses were reported to have cost the Congo more than \$1.3 billion, almost twice the combined health and education budgets.³⁴

MINERAL PROFILE: COBALT

Usually obtained as a by-product of nickel and copper production

Properties: hard, magnetic, and corrosion and heat resistant. Effective at energy storage for battery components

Based in London: Cobalt Institute in Guildford represents 70% of mined cobalt worldwide. Cobalt Committee on London Metals Exchange includes London-listed Stratton Metals Resources, Glencore, and Triland Metals, and American technology companies such as Panasonic and Tesla

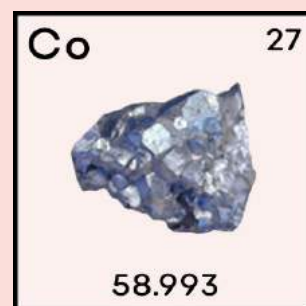
Military applications: 44% is used in battery components, including in electric motors and propulsion systems; 17% can be found in superalloys for industrial machinery such as turbines, compressors and fans,³⁵ including in fighter aircraft and helicopters, destroyers, frigates and submarines, and missiles³⁶

UK-listed companies (annual production volume):

- **Glencore** (46,300 tonnes): world-leading producer with 2 copper-cobalt mines in the Democratic Republic of Congo (DRC) and 1 nickel-cobalt operation in Australia; refinery in Norway produces cobalt cathodes³⁷

London's new frontiers:

- **Power Metal Resources:** 70% shareholding in Kisinka copper-cobalt project in DRC. Subsidiaries include Cobalt Blue Holdings with four 100% owned cobalt assets in Cameroon³⁸
- **Red Rock Resources:** 50.1% joint venture with 3 copper-cobalt licenses in Katanga, DRC³⁹
- **Arc Minerals (formerly Ortac):** registered in British Virgin Islands with subsidiaries controlling several licenses in Kalaba copper-cobalt project in Zambia⁴⁰
- **Horizonte Minerals:** 2 fully-owned nickel-cobalt deposits in Brazil (Glencore 6.1% share)⁴¹
- **Regency Mines:** owns 41% nickel-cobalt license in Papua New Guinea⁴²

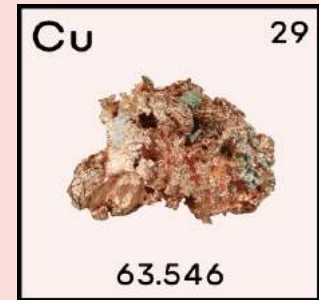


MINERAL PROFILE: COPPER

Properties: ductile, recyclable, malleable and corrosion resistant. Effective conductor used in virtually all electrical wiring

Typical waste: 1 tonne copper = 110 tonnes waste ore⁴³

By-products: ores can contain **rhenum**, used in military explosives and superalloys for jet engines, which consume 70% of global production.⁴⁴ 1,000 tonnes of refined copper ore can also yield 1 kilogram of **tellurium**, which is critical for solar and infrared materials⁴⁵



Based in London: Copper Committee on London Metals Exchange includes London-listed Amalgamated Metal Trading, Chile Copper, and Metdist Enterprises

Military applications: approximately 70% is used in electronics, including in navigation, radar and guidance systems, and in connectors, circuits and conductors for communications equipment. 12.5% is used for industrial purposes, including in airframes, landing gear and turbines, in propulsion systems and armaments, and in composite structures such as torpedoes and missiles⁴⁶

UK-listed companies (annual production volume):

- **BHP** (1,689,000 tonnes): majority-owner largest copper mine in world, Escondida in Chile, with further mines in Chile, Peru and Australia⁴⁷
- **Glencore** (1,371,000 tonnes): 2 mines in Chile, 2 in Peru and 1 in Zambia; 4 refinery and smelting operations in Australia and Canada (which includes tellurium), and smelters in Chile and the Philippines⁴⁸
- **Antofagasta** (770,000 tonnes): 4 mines in Chile⁴⁹
- **First Quantum Minerals** (702,000 tonnes): 2 mines in Zambia and mines in Australia, Finland, Mauritania, Panama, Spain and Turkey; smelters in Australia, Turkey and Zambia; hydrometallurgical plant in Spain⁵⁰
- **Anglo American** (638,000 tonnes): 3 mines and 1 smelter in Chile, and developing large deposit in Peru⁵¹
- **Rio Tinto** (577,000 tonnes): mines in Mongolia, Australia, 2 in the US and 30% share in Escondida; 1 smelter and 3 power plants in the US. \$1.5 billion plans to expand Kennecott mine in Utah, which produces 20% of the US's copper, includes collaboration with government scientists to extract rhenum and tellurium⁵²

Escondida mine, the world's largest copper producer located in the Atacama Desert in Chile, majority-owned by BHP and Rio Tinto Source: BHP



CASE STUDY: RIO TINTO IN BOUGAINVILLE



Three unidentified Bougainvilleans look over the Panguna mine Source: *The Australian*

For almost two decades, Rio Tinto subsidiary Bougainville Copper dumped over 1 billion tonnes of toxic waste from the Panguna copper and gold mine into the island's river systems, devastating aquatic life, land-based livelihoods and sacred spiritual sites. The company extracted \$2 billion in revenue during this period, and was the largest source of income for the government of Papua New Guinea (PNG).⁵³

When communities demanded reparations for this ecological disaster, their concerns were disregarded. Following acts of sabotage to bring the mine's operations to a standstill, Rio Tinto encouraged the government to address the problem with force rather than negotiation. Declaring a state of emergency, police riot squads and the military were sent to the island. The mine was shut down and abandoned in March 1990. Members of clans in the mine area established the Bougainville Revolutionary Army in response.⁵⁴

Rio Tinto was not a passive bystander as the war of liberation unfolded. The company is reported to have supplied helicopters to the PNG military, which were used to transport troops and fuel to pacify anti-mining and independence movements. This army committed acts of torture and extrajudicial killings, while orchestrating mass internment

and displacement.⁵⁵ To aid this violent repression, the government called in UK mercenary company Sandline International, staffed with former apartheid South African special forces, to train the PNG troops in counterinsurgency. By the end of the decade, up to 20,000 Bougainvilleans had lost their lives.⁵⁶

Although Bougainville voted overwhelmingly for independence in a 2019 referendum, Rio Tinto's legacy still scars the island, known to many as *Mekamui* (Sacred Island). Waste from the mine continues to flood landscapes and poison rivers, leading to chronic illnesses, including amongst children, and ongoing cultural harm.⁵⁷

Rio Tinto ceased to be a major shareholder in Bougainville Copper in 2016 and rejects responsibility for the legacies of its mining operations on the island. But the company remains culpable for an "ongoing human rights disaster" for which communities continue to demand reparations.⁵⁸

MINERAL PROFILE: PLATINUM

Properties: least reactive metal, dense and durable, malleable, and corrosion resistant

Typical waste: 1,000 ounces platinum = 16,000 tonnes waste ore⁵⁹

Based in London: World Platinum Investment Council. Platinum and Palladium Market on London Metals Exchange includes London-listed Amalgamated Metal Trading, Anglo Platinum, Triland Metals, and affiliates include Sylvania Platinum, Tharisa and G4S

Military applications: up to 70% is consumed by the automobile and industrial sectors, including in catalytic converters for engines of armoured vehicles and fighter and transport aircraft. Also used as a coating on turbine blades⁶⁰

UK-listed companies (annual production volume):

- **Anglo American** (2,051,000 ounces): world's leading producer via 79.4% interest in Anglo Platinum with 7 mines, 2 smelters and 1 refinery across the Bushveld Igneous Complex in South Africa where over 80% of global deposits are located; 1 mine in Zimbabwe⁶¹
- **Tharisa** (139,700 ounces): 1 mine in Bushveld Complex⁶²
- **Sylvania Platinum** (72,090 ounces): 6 processing plants recovering platinum-bearing tailings in Bushveld (incorporated in Bermuda)⁶³
- **Jubilee Metals Group** (30,000 ounces): 2 operations recovering platinum in Bushveld⁶⁴



DEEP-SEA MINING

Up to 10% of the world's minerals could derive from ocean floors, making the depths of the sea a prized frontier of resource accumulation.⁶⁵

Security of Supply Mineral Resources (SoS Minerals)—an initiative backed by British universities, industry and institutions, such as the Engineering and Physical Science Research Council which includes executives from BAE Systems and Thales UK, as well as direction from Airbus, Atomic Weapons Establishment, GCHQ, GKN Aerospace, Leonardo, QinetiQ, and Rolls Royce⁶⁶—ran a 'marine e-tech' project to explore the seabed for mineral extraction.⁶⁷



- **Glencore** partnered with **DeepGreen** in 2012 to secure an arrangement enabling the mining giant to take 50% of the company's nickel and copper production⁶⁸
- **UK Seabed Resources** is a wholly-owned subsidiary of the world's largest arms company, **Lockheed Martin**, and holds licenses (in partnership with the Department for Business Energy and Industrial Strategy) to explore 133,000 square kilometres of the Pacific Ocean for copper, nickel, cobalt and rare earth elements.⁶⁹ The company admits that operations would cause "extinction within the mining area" for premier organisms in the food chain, risking irreversible harm and habitat destruction⁷⁰

CASE STUDY: LONMIN'S MARIKANA MASSACRE



Three striking Marikana miners stand in front of an armoured police vehicle to negotiate while hundreds of their fellow workers gather behind them on Wonderkop hill Source: Greg Marinovich

After five months of strike action for a living wage by mineworkers at Lonmin's platinum mine in Marikana, on August 16th 2012 the South African police committed two massacres, murdering 34 people and injuring another 78. It soon became clear that the British mining company had colluded with the state to end the strike with military force.⁷¹

Days earlier, Lonmin's acting chief executive Albert Jamieson had urged a "massive police...and possible army presence" at the mine. He requested "the state bring its might to bear on this crucial sector of the economy."⁷² As a major shareholder on the board, Cyril Ramaphosa, now President of South Africa, called the workers organising independently of recognised trade unions "dastardly criminals" and advised the police "take concomitant action" in a "more pointed way" following fatal clashes between miners, police and security guards.⁷³ Four mortuary vans were ordered by police commanders, as well as assault rifles and extra ammunition.⁷⁴

This joint enterprise led to the deadliest case of state violence since the end of apartheid. Yet, in its immediate aftermath, 272 mineworkers were arrested instead, with dozens remaining incarcerated for years. The company executives and politicians who

orchestrated the massacre were exonerated by a government inquiry.⁷⁵

The UK government licensed £1 billion in military exports to South Africa over the previous decade, including £369 million in the year of the massacre.⁷⁶ This followed a \$4.8 billion arms deal with BAE Systems at the turn of the century, which included secret payments totalling over £100 million to various companies registered in tax havens.⁷⁷ In 2015, as well as attending Lonmin's offices in Johannesburg, officers from the UK's MOD visited South Africa to devise a plan with "concrete deliverables" for the ruling ANC to retain power.⁷⁸

This deadly exchange of weapons and natural resources also overdetermined the assassinations of Sikhosphi 'Bazooka' Rhadebe, chairperson of the Amadiba Crisis Committee in Xolobeni on the Eastern Cape, as well as three other community members, in March 2016. Over a decade of resistance successfully defeated Australian company MRC's proposed titanium mining project, significantly financed by London-based investor Graham Edwards, chair of property company Telereal Trillium.⁷⁹

Conditions leading to the strikes in Marikana highlight the ‘slow violence’ of resource extraction.⁸⁰ Lonmin exceeded legal limits on poisonous sulphur dioxide emissions year after year, often emitting over 8 tonnes a day, resulting in chronic lung diseases. Illegal discharges into rivers contaminated Marikana’s groundwaters with acid sludge.⁸¹

Although Lonmin was legally obliged to improve living conditions for its workers and communities around the mine, only three out of 5,500 housing units had been built by 2012.⁸² Over this period, Lonmin paid \$607 million in dividends to its shareholders, while diverting another \$160 million to a subsidiary in the tax haven of Bermuda.⁸³

In the year of the massacre, Lonmin’s chief executive was paid 236 times more than the workers on strike were murdered for demanding.⁸⁴

Divesting itself of responsibility, in 2019 Lonmin merged its assets with South African mining giant Sibanye Stillwater (also listed in New York), which has the worst workplace fatality record in the country’s industry.⁸⁵ At least 9% of Sibanye’s shares are held by London investors—including Investec—while the largest consumer of Marikana’s platinum, German multinational chemical company BASF, also has dozens of subsidiaries in the UK and 9% British-Irish ownership.⁸⁶ The Marikana workers and community continue in their struggle for justice and reparations.

MINERAL PROFILE: GOLD AND SILVER

Properties: malleable and ductile, corrosion resistant, and conductors of thermal and electrical energy

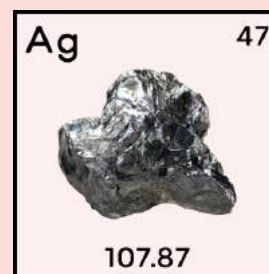
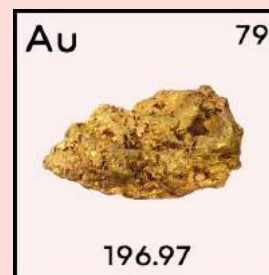
Typical waste: 1,000 ounces of gold = 79,000 tonnes of ore⁸⁷
1m ounces silver = 32,800 tonnes ore⁸⁸

Based in London: London Bullion Market Association, the gold sector’s premier accreditation body, the World Gold Council and Precious Metals Collaborative Initiative on London Metals Exchange

Military applications: 9% of gold is consumed in technological appliances,⁸⁹ including in electronics for radars and in surface detection; also used as minor component in alloys for fuselage and wings, and as coatings in electronics. 56% of silver is used for industrial purposes, including in electronics for transmitters, communications and identification systems, and in batteries. 5.6% is used in alloys, including for machine guns and torpedoes⁹⁰

UK-listed companies (annual production volumes gold/silver):

- **Fresnillo** (922,500 ounces gold; 61.8m ounces silver): largest silver producer in world operating 7 mines in Mexico⁹¹
- **Centamin** (500,000 ounces): operates gold mine in Egypt (incorporated in Jersey)⁹²
- **Resolute Mining** (430,000 ounces): 3 gold mines in Mali and Senegal⁹³
- **Antofagasta** (282,300 ounces): 2 gold-producing mines in Chile⁹⁴
- **Hochschild** (260,000 ounces gold; 19.7m ounces silver): 2 mines in Peru and 1 in Argentina⁹⁵
- **South 32** (12.2m ounces): 1 silver-producing mine in Australia⁹⁶
- **First Quantum Minerals** (257,000 ounces): gold mines in Zambia, Panama and Mauritania⁹⁷
- **Pan African Resources** (170,000 ounces): 4 gold mines and 2 retreatment plants in South Africa⁹⁸
- **Hummingbird Resources** (113,000 ounces): gold mine in Mali⁹⁹



CASE STUDY: RIO TINTO IN WEST PAPUA



Two members of Indonesia's Mobile Brigade Corps—a special operations, paramilitary and tactical unit of the Indonesian police—stand guard with their backs to the huge Grasberg mine
Source: Muhammad Adimaja/ANTARA FOTO

West Papua's sovereignty was transferred from Dutch colonial rule to Indonesia in 1963, a decision made almost 10,000 miles away in New York. Home to the world's largest deposits of gold, Grasberg mine—a joint venture between Rio Tinto and New York-listed Freeport McMoRan—has been a focal point for ongoing struggles for independence. The mine produces approximately 200,000 tonnes of waste every day, devastating the rivers, landscapes, livelihoods and sacred sites of the Amungme people indigenous to the area.¹⁰⁰ In over 50 years of mining, local communities have never been fully consulted or given their consent.¹⁰¹

A pattern of military intimidation, followed by deaths and displacements of local villagers, has similarly become a recurring feature of operations. The mine's owners have admitted to making direct payments of up to \$20 million to the Indonesian military and police for security and protection. Individual commanders have received personal compensation, in one case up to \$150,000.¹⁰² In addition to this, Freeport has spent \$35 million on military infrastructure—including

barracks, headquarters, and roads—and donated and replaced Land Rovers and Cruisers for commanders. An estimated 160 people were killed by the military around the mine between 1975 and 1997.¹⁰³

Since 2010, British arms sales to Indonesia have totalled over £780 million.¹⁰⁴ In 2017, the Indonesian military occupied villages near the mine in an escalation that led to 3 reported deaths and villagers fleeing to the forests for safety.¹⁰⁵ The Indonesian military has allegedly staged attacks by Papuan guerrillas to justify its occupying force and lucrative security relationships financed by extractive industries.¹⁰⁶

Ignoring calls for legal and financial restitution, Rio Tinto sold its interest in Grasberg for £2.77 billion a year later. It states that its departure includes the “selling on” of all liabilities and legacy issues.¹⁰⁷ From ecological catastrophes to militarised repression, Grasberg has brought multiple disasters to West Papua. While multinational corporations and armed forces continue to profit, the struggle for freedom continues.¹⁰⁸

MINERAL PROFILE: RARE EARTH ELEMENTS

Properties: significant variance between rare earth elements but generally prized for their high magnetic intensity

Typical waste: 1 tonne = 1.4 tonnes radioactive waste, 60 million litres waste gas with hydrochloric acid, and 200,000 litres acid-waste water¹⁰⁹

Based in London: China dominates global production with up to 97% of known reserves. SoS MinErals is researching how rare earth deposits form in Madagascar—which it refers to as its “own natural laboratory”—to break this “total monopoly”¹¹⁰

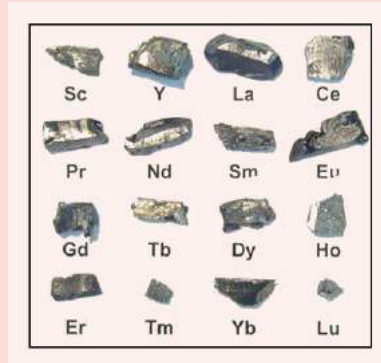
Military applications: rare earth elements are used in ammunitions, aeronautics, drones, catalytic converters for motors, permanent magnets, battery cells, lasers and x-ray tubes, and satellites. **Lanthanum** is essential to night-vision goggles; **neodymium** for laser range-finders, guidance systems and communications; and **praseodymium** for precision-guided munitions¹¹¹

UK-listed companies (annual production volume):

- **Rainbow Rare Earths:** 90% ownership of Africa’s only rare earth producing mine in Burundi. Registered in Guernsey, the company has a contract to supply up to 10,000 tonnes per annum with German multinational ThyssenKrupp.¹¹² ThyssenKrupp supplies frigates and submarines to over 20 navies around the world, including Israel where it is subject to police investigation for political corruption.¹¹³ ThyssenKrupp secured £19 million in procurement contracts with the MOD in 2018¹¹⁴

London’s new frontiers:

- **Premier African Minerals:** exploring 25 mineral blocks in Zimbabwe¹¹⁵
- **Mkango Resources:** developing deposits in Malawi¹¹⁶ having held talks (alongside Rainbow Rare Earths) with the US Defense Department¹¹⁷
- **Cadence Minerals:** partnered with Australian company Hastings Technology Metals for 8 exploration licenses in western Australia¹¹⁸



Trucks and workers preparing the initial mining area at Gakara in Burundi in order to extract rare earth elements Source: Roskill



CORPORATE COUNTERINSURGENCY

Emerging from colonial wars—including Britain in South Africa, Kenya and Malaya, France in Algeria, and the US in the Philippines¹¹⁹—counterinsurgency describes an **asymmetrical style of warfare that emphasises “intelligence networks, psychological operations, media manipulation, security provision and social development to maintain governmental and extractive legitimacy.”**¹²⁰

In other words, counterinsurgency is a military strategy to contain or extinguish the threat (and presence) of resistance to the authority of an occupying power.¹²¹ Extractive industries similarly target ‘hearts and minds’ to pacify their opposition. Some firms state explicitly that ‘corporate counterinsurgency’ intends to engineer conditions that are “predictable rather than peaceful,” while ignoring the root causes of violence.¹²²

For example, Glencore highlights how strategic investment in “community relations,” such as infrastructure projects and youth leadership programmes, help avoid negative impacts on the company’s “social license to operate” and “profitability,” or its capacity to “secure access to new resources.”¹²³ Mining companies sponsor everything from schools to medical clinics, often catering to genuine desires in communities for social investment. But this tactic also exploits state-led deprivation to justify extractive operations that contribute to these grievances.¹²⁴

Managing public perception on local to global scales, Glencore’s slogan claims consumers around the world rely on its minerals to “advance everyday life.” Similarly, BHP and Anglo American brand their materials as “essential to modern life.” Rio Tinto’s are announced as integral to “human progress.” In doing so, **communities resisting the ecological and social violence caused by mining**



are intentionally displaced outside the categories of modernity and humanity.

Environmental initiatives are increasingly deployed by mining companies to rebrand and diversify their investment portfolios, a strategy to ‘greenwash’ the ecological and social harm of their operations.

Annual reports are now covered with photos of wind turbines, electric vehicles and solar panels. Rio Tinto champions itself as a “pioneer” with materials “essential for a low-carbon future.”¹²⁵ Anglo American also claims to be “leading in sustainable mining” by aligning itself, in principle, to the United Nations’ Sustainable Development Goals.¹²⁶

Fundamentally, when armies or corporations employ counterinsurgency methods, their intention is to supplement rather than replace harder forms of military power, a ‘low-intensity’ form of warfare.

ALLOY PROFILE: STEEL

1.87 billion tonnes of steel were produced in 2019, with over a third used in mechanical equipment including aerospace, aeronautics and automobiles¹²⁷

Base metal properties: magnetic, reactive and an efficient conductor of electricity and heat, 98% of **iron ore** is used for steel. To improve strength and resistance to corrosion, around 85% of **manganese** is consumed in steel production. Over two-thirds of **nickel** is used to make stainless steel, with significant amounts also applied in alloys and electroplating.¹²⁸ At least half of mined **zinc** is used to galvanise steel as a coating to prevent corrosion and improve strength and flexibility.¹²⁹ **Metallurgical coal** is an essential fuel for primary steelmaking, with 770 kilograms required to make 1 tonne of steel¹³⁰



Typical waste: 1 tonne iron ore = 3 tonnes waste; 1 tonne manganese = up to 2.5 tonnes ore;¹³¹ 1 tonne zinc = up to 33 tonnes ore;¹³² 1 tonne nickel = up to 100 tonnes ore

Based in London: London Metals Exchange includes Nickel Committee with UK-listed companies Glencore, Stratton Metals Resources, Anglo American, and Elg Haniel Metals; and Zinc Committee which includes Glencore and Concord Resources

Military applications: steel alloys are used in fighter and transport aircraft, destroyers, frigates and submarines, torpedoes and missiles, and tanks and infantry fighter vehicles

- Nickel is a principal component in superalloys used in jet turbine engines; in electronic systems, sensors and seekers in missiles; in coatings for aerospace and aeronautical equipment; and in missiles and assault rifles
- Zinc substrates are used in electronics for radar and infra-red detectors¹³³

UK-listed companies (annual production volume):

- **Rio Tinto** (326,700,000 tonnes iron ore): 16 iron ore mines and 4 ports and power plants across Pilbara region of Australia; mine and processing plant in Canada¹³⁴
- **BHP** (238,000,000 tonnes iron ore; 70,000,000 tonnes metallurgical coal): iron ore mines in western Australia and Brazil; 9 metallurgical coal mines in central Queensland, Australia¹³⁵
- **Glencore** (121,000 tonnes nickel; 1,078,000 tonnes zinc; 139,500,000 tonnes metallurgical coal): 2 nickel mines and a smelter in Canada, 1 mine in New Caledonia, refineries in western Australia and Norway; zinc mines in Argentina, 3 in Peru, 4 in Bolivia, 2 in Canada, 1 in Kazakhstan and Australia; metallurgical coal mines in Australia¹³⁶
- **Anglo American** (65,100,000 tonnes iron ore; 42,600 tonnes nickel; 22,900,000 tonnes metallurgical coal): 3 iron ore mines in South Africa and 1 in Brazil; 2 nickel mines in Brazil; 4 metallurgical coal mines in Australia¹³⁷
- **South 32** (41,100 tonnes nickel; 218,200 tonnes zinc; 5,540,000 tonnes manganese; 5,350,000 tonnes metallurgical coal): nickel mine and smelter in Colombia; zinc mine in Australia; and largest producer manganese with 1 mine and alloy plant in Australia, and 2 mines and a smelter in South Africa via Samancor, a joint venture with Anglo American¹³⁸

MARTIAL MINING UNDER COVID-19



Caption: aerial view of workers at the Antamina copper mine in Peru Source: *Revista Proactivo*

Mines have become hotspots for the spread of coronavirus. By June, at least 4,000 mine workers were reported to have been infected in 18 different countries.¹³⁹ Although the pandemic is being used by companies to establish a positive image as “public-minded saviours,” a coalition of 330 organisations have responded in an open letter that the mining industry is seeking to profit from the pandemic instead.¹⁴⁰

Like the arms industry, mining companies have pushed to categorise themselves as “essential” in order to enable their operations to continue. This ignores the threat to the health and safety of workers, their families, and rural and urban communities struggling to defend public health and their lands.¹⁴¹ With elevated exposure to heavy metal toxicity and respiratory and pulmonary illnesses, as well as reduced access to clean water, mining increases vulnerability to coronavirus.¹⁴²

Jointly owned by Glencore and BHP, operations at Antamina copper mine in Peru did not shut down until two weeks after reporting its first infection. As of April 30, one worker had died with another 210

infected.¹⁴³ At the same time, the Peruvian government approved a law enabling the police and military—who regularly provide security services for mining companies—to use lethal force with near impunity.¹⁴⁴ With widespread restrictions imposed on people’s freedom of association and movement, repressive measures are being used to shut down legitimate protests across the world.

Under emergency cover, companies are also securing “regulatory change that favours the industry at the expense of people and planet.”¹⁴⁵ Anglo American and its two Brazilian subsidiaries have submitted nearly 300 applications to explore for gold and other minerals in the Amazon, including in Indigenous territories under attack by the Bolsonaro administration.¹⁴⁶

The open letter condemns these “acts of aggression.” It affirms that “intersecting global health, economic, ecological and climate crises” demand that the health of communities, Indigenous peoples, workers and social movements—not the profits of predatory mining corporations—come first.¹⁴⁷

MINERAL PROFILE: TITANIUM

Ilmenite and rutile are the main ore bodies for titanium. Although mostly processed into titanium dioxide (a whitening pigment used in paints, foods, and medicines), up to 10% of titanium minerals are chlorinated and reduced to 'sponge' metal¹⁴⁸

Properties: high strength and lightweight, resistant to corrosion and durable in extreme conditions

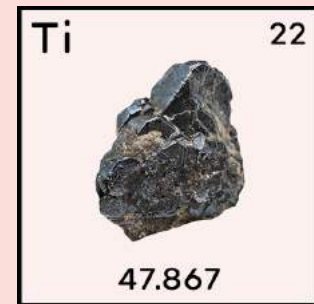
Typical waste: 1 tonne of pigment = 4 tonnes waste ore¹⁴⁹

By-products: titanium ores can produce **hafnium**, the vast majority of which is used in the nuclear (56%) and aerospace (33%) industries¹⁵⁰

Military applications: up to 8% is used in military aerospace equipment,¹⁵¹ including in alloys for airframes, jet engines, tank armour, turbines, and landing gear; in missile frames and torpedoes; and in platforms and propulsion for satellites. An estimated 9% of titanium dioxide is used for military purposes, mostly in electro-optical systems.¹⁵² Porton Down, the UK's military research base, recently reduced the titanium production processes significantly which could see a "huge expansion of titanium parts and equipment throughout the military"¹⁵³

UK-listed companies (annual production volume):

- **Rio Tinto** (1,206,000 tonnes): mines in Madagascar, South Africa and Canada;¹⁵⁴ in cooperative agreement with London-listed **Bluejay Mining's** Dundas project in Greenland, the world's highest grade ilmenite mineral sands¹⁵⁵
- **Kenmare Resources** (892,900 tonnes): mine in Mozambique¹⁵⁶



MINERAL PROFILE: TUNGSTEN

Properties: highest melting point of all elements, dense and effective electrical conductor

Typical ore waste: 1 tonne = up to 1,000 tonnes waste ore¹⁵⁷

Based in London: International Tungsten Industry Association, including London-listed companies A&M Minerals & Metals, W Resources, and Wogen Resources

Military applications: at least 8% used by defence industry¹⁵⁸ in ammunition and material for ballast; fragment generators, shape charges and nozzle throats in jet engine components; anti-armour warheads; and as tungsten carbide, essential for cutting machines¹⁵⁹

London's new frontiers:

- **Strategic Minerals:** subsidiary Cornwall Resources is operating Redmoor mine in the UK, which ranks as the largest undeveloped tungsten underground mining project in the world¹⁶⁰
- **Tungsten West:** developing one of the world's largest tungsten deposits in Devon (UK)¹⁶¹
- **W Resources:** developing tungsten mines in Spain and Portugal¹⁶²
- **Premier African Minerals:** operates project in Zimbabwe (incorporated in British Virgin Islands)¹⁶³



CASE STUDY: RIO TINTO IN MADAGASCAR



A Malagasy worker walks along an access track at Rio Tinto's ilmenite mine in Fort Dauphin, Madagascar, in 2007 Source: Ed Harris (Reuters)

Rio Tinto owns 80% of the QIT-Madagascar Minerals (QMM) ilmenite mine near Tôlañaro on the southeast coast of Madagascar. QMM documented 498 people who lost their land and livelihoods in developing the mine, with many receiving only a fraction of promised compensation.¹⁶⁴

Malagasy farmers and fishers were displaced two-fold, first for the mine and then a spatially separate “biodiversity offsetting” project. Both introduce principles of surveillance and commerce into the landscape by formalising and transferring property rights to international investors and non-governmental organisations.¹⁶⁵ In a region where 91% of people live in multidimensional poverty, these land grabs have further constrained access to food security.¹⁶⁶

Offsetting inherently assumes that environmental damage will occur elsewhere. In QMM's case, the company has breached an environmental buffer zone meant to protect local waterways, now contaminated with levels of uranium up to 350 times more than safe drinking guidelines. This poses

a significant health risk to 15,000 people's drinking water.¹⁶⁷

A succession of protests and general strikes have followed, demanding reparations and resisting evictions, the destruction of sacred forests and exclusion from ancestral lands. In 2013, protestors kept QMM workers hostage on the mining site. When Rio Tinto threatened to exit the country, the military intervened, firing tear gas and handcuffing, beating and dragging protestors.¹⁶⁸ Five years later, locals took to the streets and blocked roads accessing the mine site. QMM responded with criminalisation and legal action, resulting in the incarceration of multiple protestors.¹⁶⁹

Rio Tinto has deleted claims on its website to have delivered ‘human rights’ trainings to Malagasy police and military over this period.¹⁷⁰ It has coincided with a spike in violations, with thousands of local community members held in unjustified pre-trial detention. Journalists, environmental and human rights defenders have been particular targets.¹⁷¹

MINERAL PROFILE: URANIUM

Properties: heavy, high density and radioactive

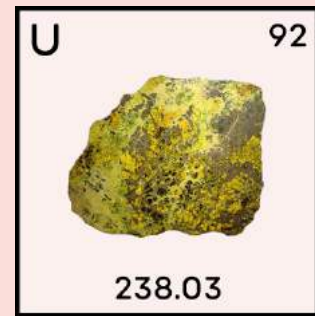
Typical ore waste: 1 tonne = up to 1,000 tonnes waste ore rock containing concentrations of radioisotopes with half lives up to 4.5 billion years.¹⁷² Workers in uranium mines are “exposed to higher amounts of internal radiation than...in any other segment of the nuclear energy industry”¹⁷³

Based in London: World Nuclear Association, whose members represent 70% of the world’s nuclear power and the vast majority of the world’s uranium, conversion and enrichment production

Military application: Before uranium attains weapons grade, it is mined as ore, processed into yellowcake, converted into hexafluoride, and then enriched and pressed into bomb fuel for projectiles and fissile explosives.¹⁷⁴ Uranium is also used in nuclear-powered submarines, and its by-products, including depleted uranium, are used to create bullets

UK-listed companies (annual production volume):

- **BHP** (3,364 tonnes): Olympic Dam in Australia, the world’s largest uranium ore body¹⁷⁵
- **Rio Tinto** (1,964 tonnes):¹⁷⁶ sold its entire interest in the Rössing mine in Namibia to China National Uranium Corporation Limited (CNUC) for an initial cash payment of \$6.5 million plus a contingent payment of up to \$100 million¹⁷⁷
- **Kazatomprom** (22,800 tonnes):¹⁷⁸ world’s largest uranium producer listed 15% of its shares in London in November 2018. AIM-listed **Yellow Cake** (incorporated in Jersey) has secured long-term contracts to purchase and hold over 4,275 tonnes of uranium oxide from Kazatomprom¹⁷⁹
- **Berkeley Energia:** planned open-cast uranium mine in Spain¹⁸⁰



Olympic Dam in south Australia, the world’s largest uranium ore body, also with copper and gold deposits, and owned by BHP



acid mine
drainage



mining site



community
resistance



militarised repression

M A
M
C



conflict zones

military bases
and training

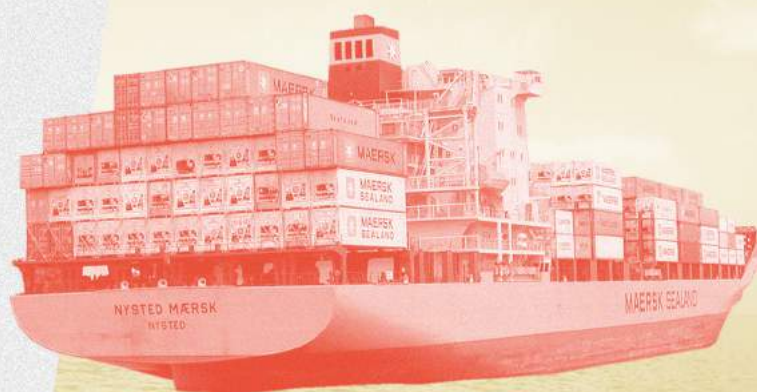
arms f



transportation
of minerals

smelters, refineries

PARTIAL MINING CYCLE



transportation of
components and parts



factories

MATERIAL MILITARIES

The MOD is the “single largest customer” for UK industry.¹ Responsible for the “procurement of clothes to carriers, food to fighter jets,” trading entity Defence Equipment and Support manages over 600 live projects in at least 150 locations around the world for the Royal Navy, British Army and Royal Air Force (RAF).² With an emphasis on “technology-led modernisation,” the UK’s military-industrial sector plans to enable “new levels of lethality” across multiple domains of conflict: land, sea, air, cyber and space.³ The MOD asserts this next generation of military hardware, scheduled to cost up to £350 billion, will “radically change the nature and environment of warfare in the future.”⁴ But how does warfare itself transform nature and the environment?

The UK’s military-industrial sector emits at least 11 million tonnes of carbon a year, more than 60 individual countries, such as Madagascar and Zambia.⁵ This calculation does not include emissions across the supply chain, from raw material extraction to the use of weapons in wars. But the global arms trade, like most others, depends on the extraction of natural resources to manufacture and sell products. Despite noted difficulties in determining the proportion of raw materials consumed each year by militaries around the world, previous estimates indicate it amounts to at least 6%.⁶

America’s National Mining Association (of which Rio Tinto is a member) proudly asserts that mining is the “backbone of advanced military equipment and technologies.”⁷ It estimates that the Pentagon consumes around 750,000 tonnes of minerals a year.⁸ Given this foundational role, it is notable that the UK, unlike the US and European Union, does not appear to have a critical minerals strategy. The MOD has not replied within the statutory period to Freedom of Information requests to clarify which (if any) raw materials are considered ‘critical’ or ‘strategic’ to national security or the defence industry.

However, a 2010 inquiry by parliament’s Science and Technology Committee identified a **“long-term, stable source” of cobalt, platinum, rare earth elements, and by-products hafnium and rhenium, as the “highest concern” to the UK aerospace and arms industries.**⁹

The MOD’s guidance that “weapon reviews inherently deal with classified material” means that their environmental impacts are “always bounded by important concerns of national security.”¹⁰ However, this author’s **review of the MOD’s most recent equipment orders of aircraft fighters and carriers, nuclear submarines and armoured vehicles, suggest a minimum cumulative weight of 514,270 tonnes of raw materials will be necessary for their production.** This does not include personal equipment, communication devices or small arms, including bullets and grenades. A conservative estimate suggests this demand alone will lead to hundreds of millions of tonnes of toxic waste being dumped in communities and ecosystems around the world.

Representing 2.5% of global military spending,¹¹ scaling up the UK’s resource consumption would suggest a demand of at least 20.6 million tonnes of minerals just to re-equip the world’s armies over the coming decade, invariably leading to billions of tonnes of acid mine drainage.

The following section of this report highlights the UK’s incoming generation of military hardware (and software) and the materials essential to their production.

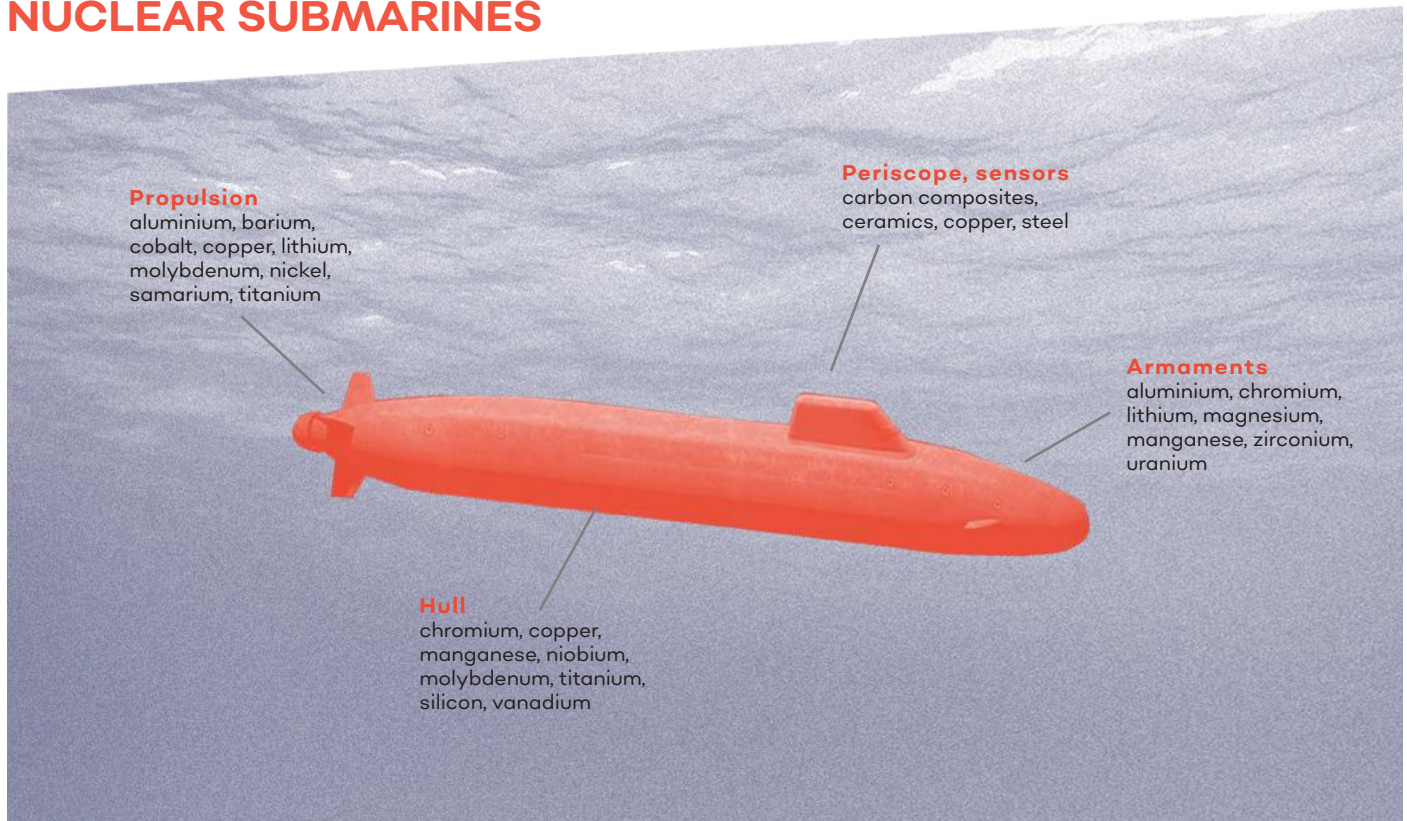
New UK military equipment (number ordered)



Explosion in Izmir district of Turkey after combat helicopters hit targets during largest-ever multinational military exercise featuring American and British contingents, 2016 Source: Anadolu



NUCLEAR SUBMARINES



Britain has a nuclear arsenal of 120 weapons, with a stockpile of 215.¹² In July 2016, parliament voted to renew the Trident nuclear weapons system and deliver seven Astute Class submarines and four Dreadnought Class submarines, leaving at least one on patrol at all times.¹³ This is estimated to cost £205 billion over its programme of operation, including manufacturing, in service costs and decommissioning.¹⁴

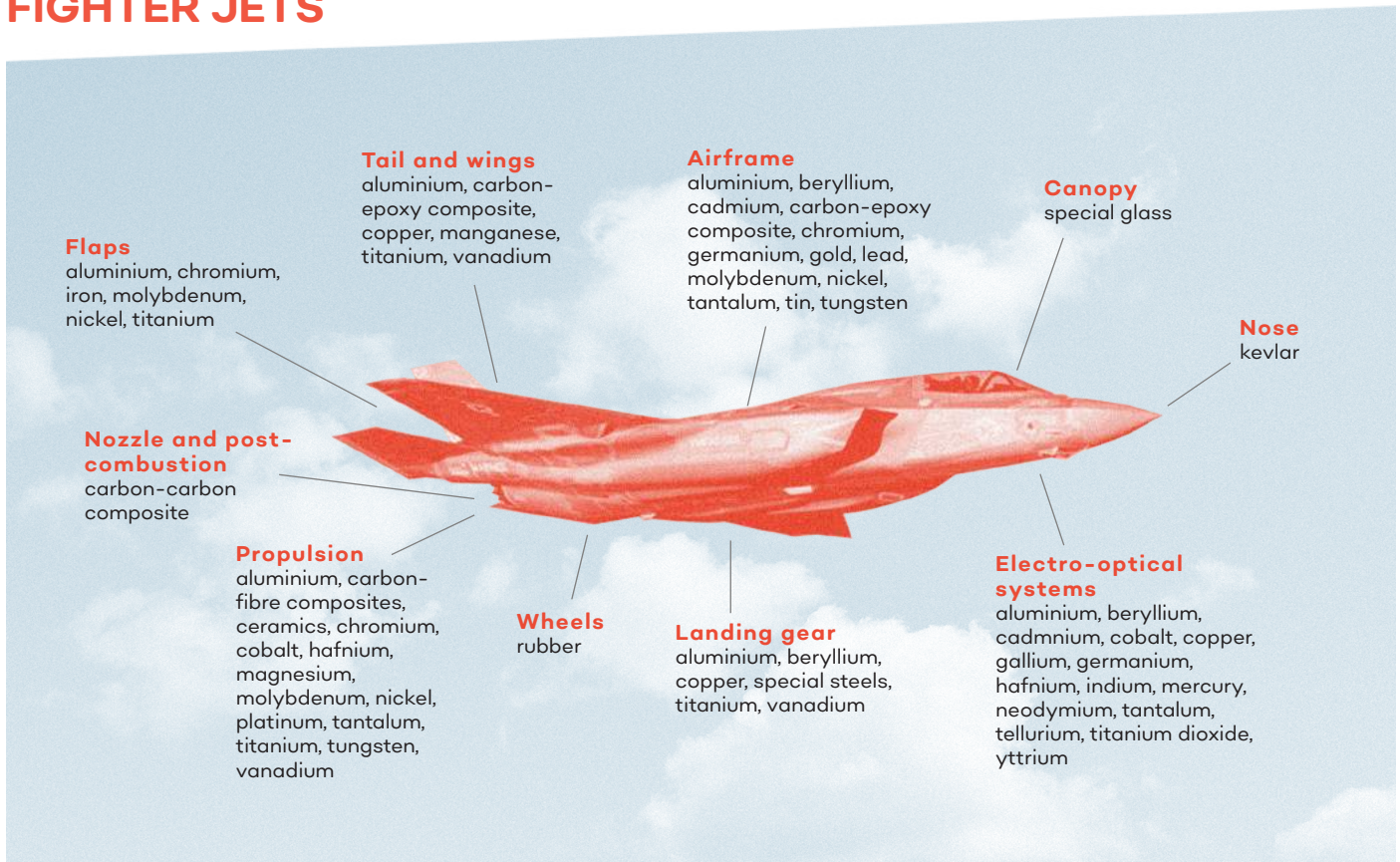
The MOD, BAE Systems and Rolls Royce formed an alliance to assemble the largest submarines ever built for the Royal Navy, totalling 68,800 tonnes of material, 170 kilometres of pipes, 52,000 electrical items, 1,496 kilometres of cables and carrying up to 16 Trident missiles, which share 48 warheads.¹⁵ Thales UK was awarded a £330 million contract to provide the submarines with sonar and sensor systems that combine electronic warfare and camera technology.¹⁶

Britain's nuclear bombs are made and serviced by the Atomic Weapons Establishment, majority-owned by Lockheed Martin (51%) alongside Serco Group (24.5%),¹⁷ which is also responsible for running several UK immigration detention centres.¹⁸

The manufacture of a single nuclear bomb is estimated to produce 2,000 metric tonnes of radioactive uranium mining waste and four metric tonnes of depleted uranium.¹⁹ Each warhead—using a combination of extreme heat, blast and ionising radiation—has the potential to destroy a radius of 1.8 kilometres, with progressively less destruction up to 8 kilometres. The toxic fallout injects dense smoke into the atmosphere and blocks incoming solar radiation, potentially leading to widespread climate cooling. Any major damage to the ozone layer would result in crop failures and mass famines.²⁰

Where nuclear weapons are unused, they must be decommissioned. While the MOD has retired 20 nuclear-powered submarines since 1980, all containing large amounts of radioactive waste, they have not managed to dismantle any. **Independent calculations suggest that the MOD needs to dispose of 4,500 tonnes of hazardous material, with 1,000 tonnes being especially dangerous. Until 1983, the MoD dumped this waste straight into the ocean.**²¹

FIGHTER JETS



Lockheed Martin's F-35 joint strike fighter is the most expensive weapons system in history, composed of 300,000 individual parts and assembled from 1,900 suppliers around the globe.²² As the F-35 repair and maintenance hub, the UK is responsible for building approximately 15% of the 3,000 jets planned for production with a supply chain of up to 500 companies.²³ This includes GKN Aerospace and BAE Systems, which is contributing 30 separate titanium parts for the aircraft's vertical tail fin.²⁴

As a “digital jet for the modern battlespace,” the aircraft is fitted with advanced sensor fusion for electronic warfare, enabling it to locate and track enemy forces and jam radars.²⁵ Accordingly, a single F-35 requires 417 kilograms of rare earth elements.²⁶

Despite these modernising features, these aircraft are still scheduled to use the most carbon intensive fuel, kerosene.²⁷ The UK has agreed to purchase up to 138 for its own military operations, likely to cost at least £27 billion.²⁸

Another generation of aircraft is being modelled to replace the RAF's 157 Eurofighter Typhoon jets and “guarantee combat dominance in air.” In partnership with the MOD, this £1.9 billion ‘Future Combat Aircraft System’ project is being delivered by Team Tempest, a consortium including BAE Systems, Leonardo, Rolls-Royce and MBDA missile systems (itself a joint venture company including BAE Systems, Airbus and Leonardo).²⁹

GREEN WEAPONS



Showcase of Airbus' Zephyr drone using solar-winged craft for power at Xponential 2017 *Source Alley Watch*

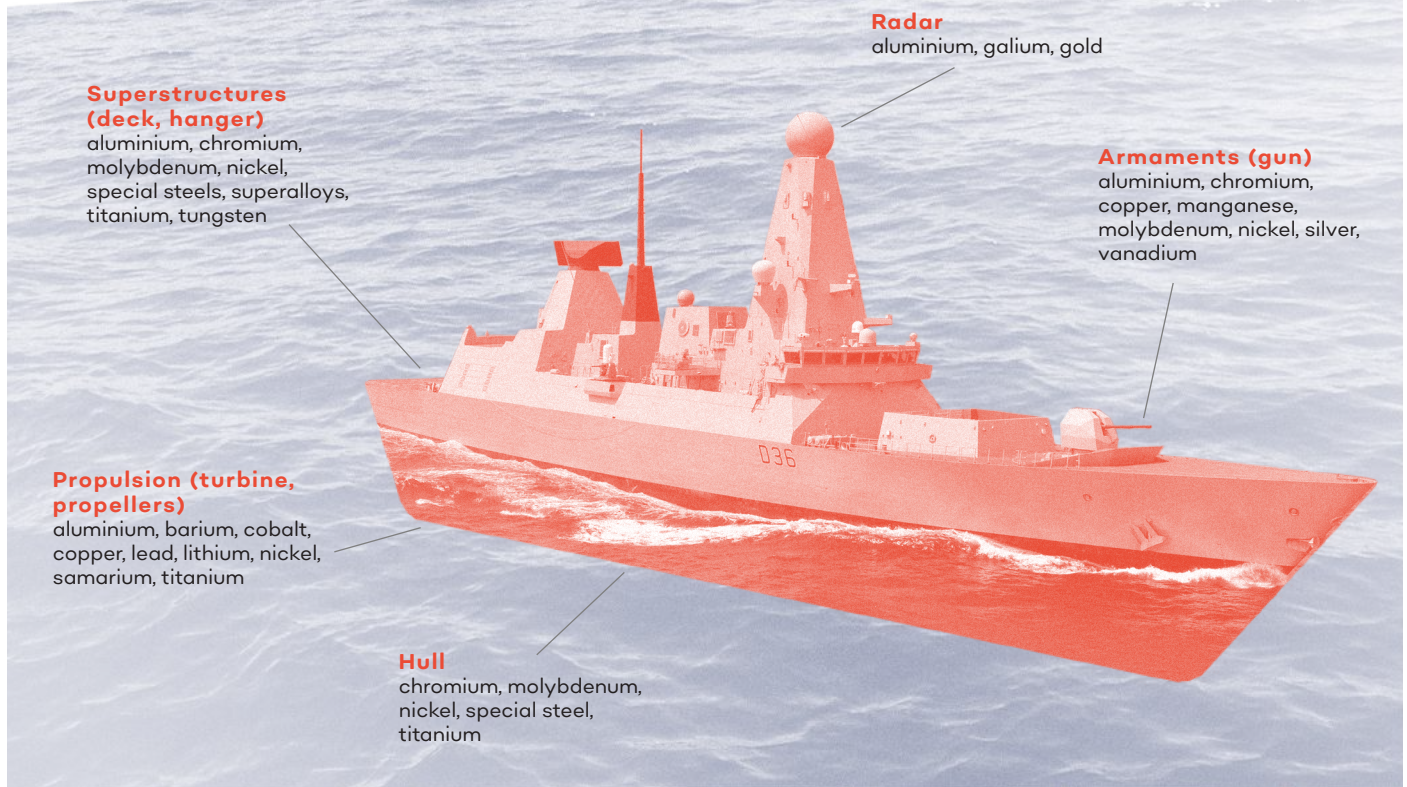
In 2019, at the world's largest arms fair in London, the British army's Chief of General Staff, Sir Mark Carleton-Smith, asserted the "next generation" of military equipment "must exploit British industry's leadership in the clean environmental technology sector." More than a "commercial opportunity," he argues this will be necessary to get the army "on the right side of the environmental argument," especially with younger recruits.³⁰

Arms companies have responded practically by developing 'environmentally friendly weapons.' Lithium-ion battery tanks have been tested by the Israeli military³¹ and Airbus has demonstrated algae-fuelled aircraft.³² Many arms companies are rolling-out solar-powered drones, including BAE Systems,³³ Leonardo³⁴ and Airbus, who received £15 million in MOD orders for three Zephyr drones.³⁵ Lockheed Martin's venture capital arm has invested in Ocean Aero, a business manufacturing solar-powered submarines.³⁶

Additionally, BAE Systems, among others, now test their equipment in a "wider range of temperatures" due to the extreme heat in many of its "key markets." In collaboration with NP Aerospace and General Dynamics UK, the MOD is testing new "electric technology" on the army's Foxhound and Jackal vehicles to improve both "sustainability and military effectiveness," with electrical systems offering increased stealth capability due to reduced noise.³⁷

The World Bank's Climate-Smart Mining Facility, which includes Rio Tinto and Anglo American, predicts that lithium production will need to increase 965% by 2050, cobalt by 585% and nickel 108% to satiate demand for green technologies.³⁸

NAVAL VESSELS



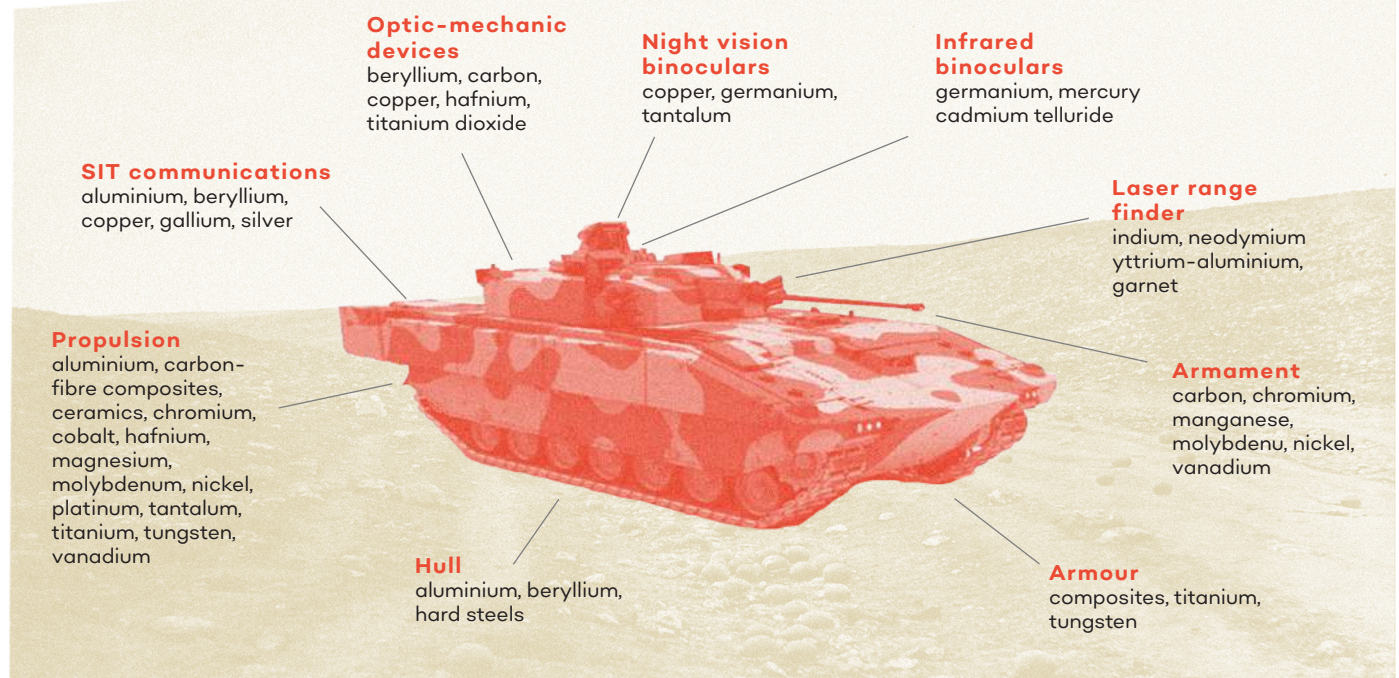
Britain's new aircraft carriers are the "largest warships ever built" in the UK.³⁹ Longer than the Houses of Parliament, costing £6.3 billion and weighing 65,000 tonnes, each carrier has the capacity to embark thirty-six F-35s.⁴⁰ The Aircraft Carrier Alliance includes the MOD, BAE Systems, Thales and Babcock, as well as over 200 direct suppliers. Its introduction is intended to provide Britain with "eight acres of sovereign territory" that can "deliver a high profile and coercive presence worldwide."⁴¹

The alliance claims the carriers are "built by the nation for the nation." But massive quantities of steel and titanium, two large gas-turbine and four diesel engines, over 250,000 kilometres of electrical cables and 8,000 kilometres of fibre-optic cable suggest the minerals required to assemble them are anything but restricted to the UK's territorial landmass.⁴²

Four Royal Fleet Auxiliary Tide Class tankers have also recently been brought into service, providing fuel, food and ammunition to Royal Navy vessels around the world. Designed and manufactured by American arms manufacturer General Dynamics and built in South Korea, costing over £600 million, these tankers each include a Phalanx weaponry system and radar-controlled Gatling guns capable of spewing 3,000 rounds a minute.⁴³

Eight Global Combat Ships (Type 26 frigates) are scheduled to be delivered in 2020 by BAE Systems, with anti-air missile systems, surveillance radars and armour protection respectively provided by MBDA, Thales, and Plasan, an Israeli specialist.⁴⁴ Five new Type 31e frigates are being built by Babcock.⁴⁵

ARMoured VEHICLES



The UK's "biggest order of armoured vehicles in a generation" is due to enter service in 2020.⁴⁶ The MOD has spent £4.5 billion to "modernise (its) frontline fleet" with 589 "fully-digitised" vehicles.⁴⁷ Each AJAX is kitted with microphones to locate enemy vehicles, laser-warning systems with smoke grenade launchers, thermal imagery

technology and eight surveillance cameras. It is stabilised with an automatic cannon and coaxial machine gun. Manufacturer General Dynamics UK claims that the vehicles are "future-proofed" to ensure rapid upgrades and incorporate the latest technologies, with suppliers including Lockheed Martin and Thales.⁴⁸

MILITARISED ENVIRONMENTALISM

Global military powers frame climate change as a security issue. This roots their concerns in questions of operability, and expands rather than reduces their spheres of activity: safeguarding trade routes, improving the efficiency and diversity of energy supplies, and managing resource scarcity and mass displacement.⁴⁹

The MOD's climate policy prepares the British army to operate in the Arctic region as ice sheets recede; to assist with natural disasters around the globe; and to be deployed under more "extreme weather patterns."⁵⁰

While the origins of many national parks are rooted in the colonial dispossession of Indigenous peoples,⁵¹ the presence of military and paramilitary actors and technologies in conservation is growing. With the 'illegal wildlife trade' now worth an estimated £17 billion, "UK Armed Forces are intervening."⁵²

Under a £36 million project alongside the Department for Environment, Food and Rural Affairs, the British army is running 'counter-poaching programmes' to provide surveillance equipment and training to park guards and police. After a 2017 pilot, it is expanding to cover 3 parks in Malawi with plans to include Botswana and Zambia.⁵³ In 2018, British forces trained 168 'ecoguards' in Gabon⁵⁴ and undertook similar operations in Uganda.⁵⁵



An African elephant in Malawi's Nkhotakota and Majete Wildlife Reserves and an armed British soldier move past each other at a distance. The soldier looks ahead Source: Forces Net, August 2018

MISSILES



Supporting over half of Britain's missile inventory, the Complex Weapons Programme was established in 2010 between the MOD and MBDA.⁵⁶ MBDA is also developing a 50 kilowatt laser weapon technology via the Dragonfire consortium to "put the UK at the forefront of high energy laser systems."⁵⁷

MBDA delivered 500 Brimstone missiles in the first two years of the programme alone. A typical missile can cause concrete columns in buildings to fail within a 20 metre radius of the explosion.⁵⁸ In March 2018, the MOD placed a £400 million order to deliver upgraded precision-guided missile for the RAF's Typhoon jets.⁵⁹

BULLETS

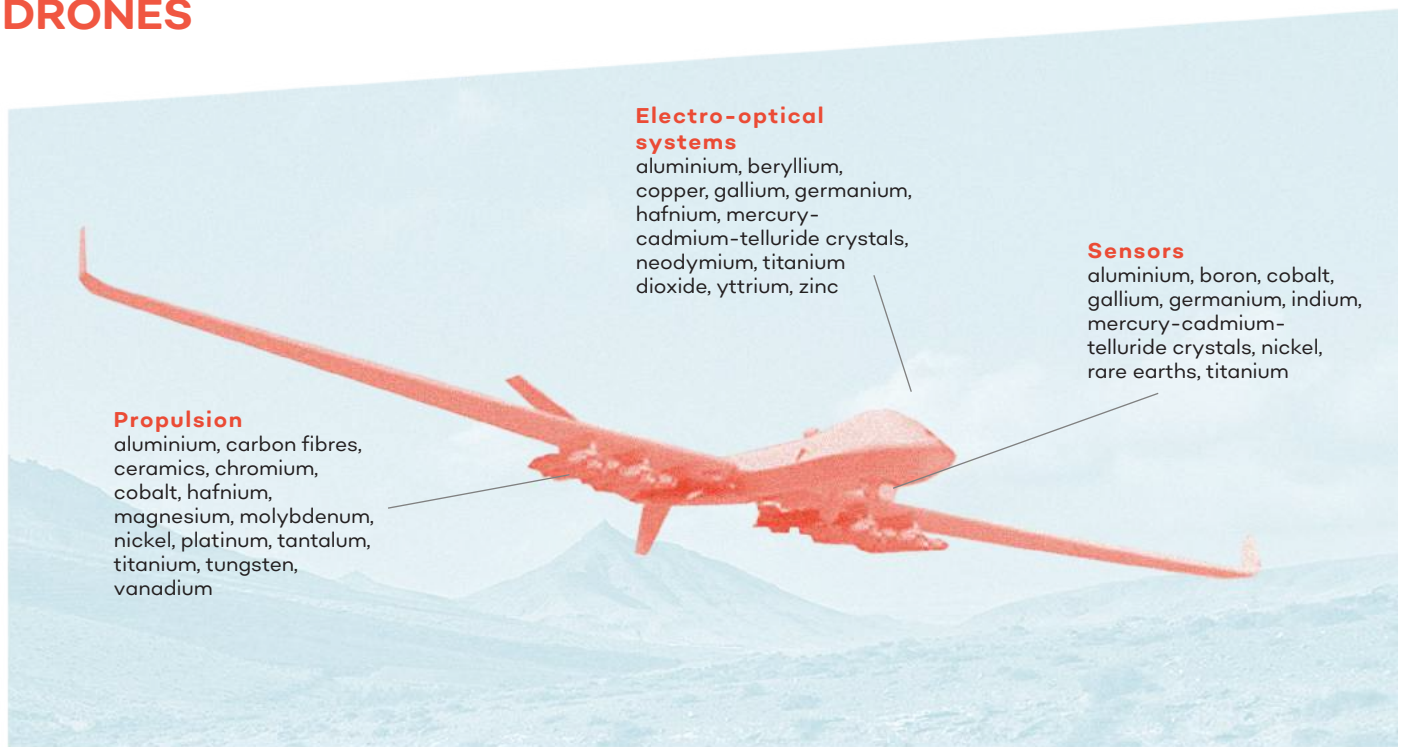
It is estimated that 12 billion bullets are produced globally each year.⁶⁰ **BAE Systems can produce 1 million rounds of small arms ammunition a day, and has provided nearly all of the British army's requirements since 1940.**⁶¹ Most cast bullets are made of **lead**, often alloyed with **tin** and **antimony** and placed in copper-zinc brass cases.

Glencore's subsidiary Britannia Refined Metals, based in Kent (UK), is the largest primary lead producer in Europe, with mines in Argentina, Australia, Bolivia, Canada, Kazakhstan and Peru. At least 3% of all lead production is used for ammunition, which in Glencore's case would be 84,000 tonnes.⁶²

Equally, antimony is regarded as "vital to military effectiveness," as it is also used in night vision goggles, optics and laser sightings.⁶³ London-listed **Tri-Star Resources recently secured a 40% interest in a processing port in Sohar, Oman, which is predicted to produce up to a fifth of the world's antimony.**⁶⁴



DRONES



A ‘Revolution in Military Affairs’ at the end of the 20th century ushered in new doctrines, strategies, tactics and technologies to transform the practice and experience of warfare.⁶⁵ The growing use of remotely-controlled, armed unmanned systems has been a particularly prominent feature.⁶⁶ Drones have lowered the threshold for lethal force, with claims they would constitute a more effective form of aerial warfare widely repudiated by human rights testimonies and investigative accounts.⁶⁷

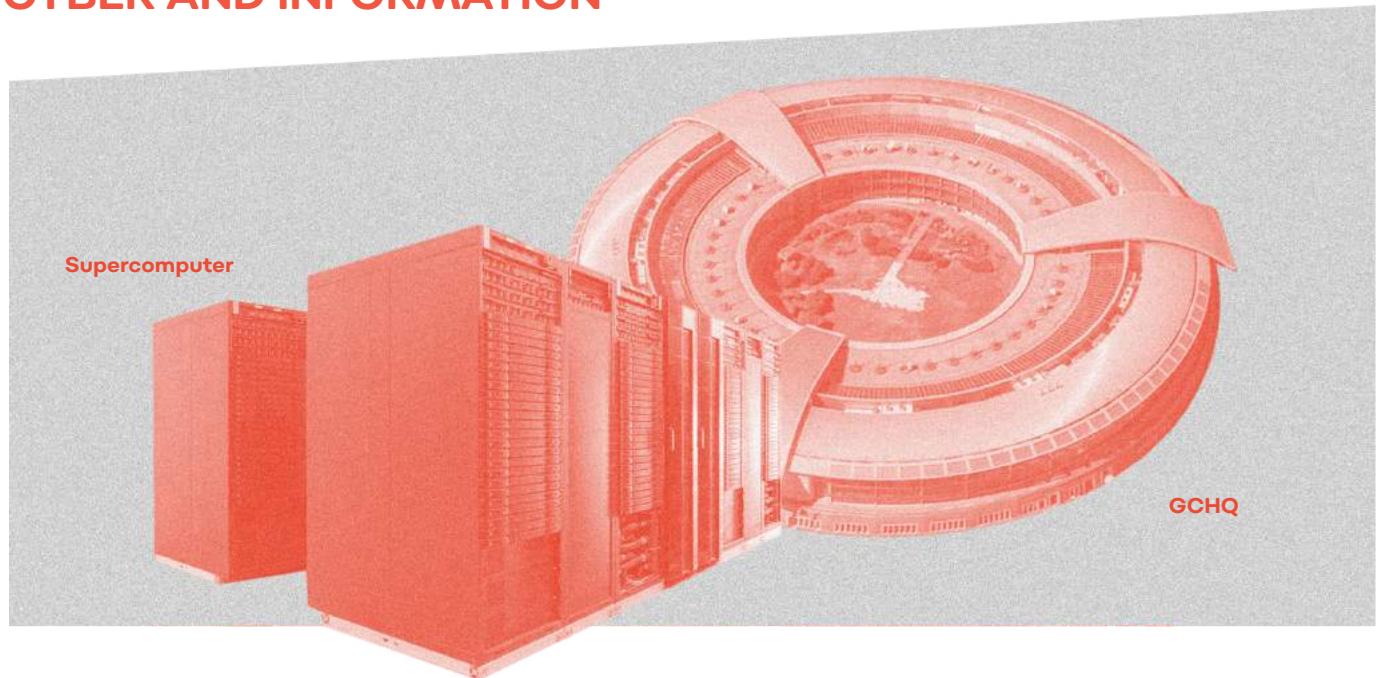
Four RAF bases in the UK provide direct support to the US drone war across the globe, which has led to at least 1,700 civilian deaths through “targeted killings” and is regarded as illegal under international law. Although British support is “absolutely crucial to the US lethal drones programme,” according to Amnesty International, there are no policies or oversight mechanisms preventing UK intelligence from being shared in these operations.⁶⁸

But Britain has its own fleet of drones. Armed with missiles and laser-guided bombs, nine Reaper drones manufactured by General Atomics are operated by RAF crew from bases in Nevada and Lincolnshire.⁶⁹ By 2017, this fleet had spent over 100,000 hours in the air since its operations began a decade

earlier in Afghanistan, equivalent to 550 traversals of the globe.⁷⁰ The Reaper is scheduled to be replaced by 26 Protector drones by 2025, costing an estimated \$1 billion and also manufactured by General Atomics. These lethal machines will be operated entirely from the UK, each able to carry and drop up to 18 Brimstone missiles anywhere in the world.⁷¹

Many of the arms traders that profit from fuelling war and climate chaos, such as Leonardo, Thales and Airbus, are also primary contractors for the technologies, including drones and sensors, which are used to militarise borders and prevent safe routes of passage for people fleeing conflict and environmental devastation.⁷²

CYBER AND INFORMATION



The Government Communications Headquarters (GCHQ) is responsible for providing signals intelligence to the British government and armed forces. Although it claims to be at the “heart of the nation’s security,” the European Court of Human Rights ruled in 2018 that GCHQ was involved in unlawful mass surveillance that violated millions of people’s rights to privacy and freedom of expression.⁷³

GCHQ’s infamous ‘Doughnut’ building contains banks of supercomputers with 3,000 kilometres of fibre-optics installed by British Telecom and 10,000 kilometres of electrical wiring.⁷⁴ Each computer includes significant quantities of raw materials, including copper conductors, gold pin platings, cobalt and nickel alloys on hard disk platters, and neodymium, gallium and tantalum in insulators, transistors and processors.⁷⁵

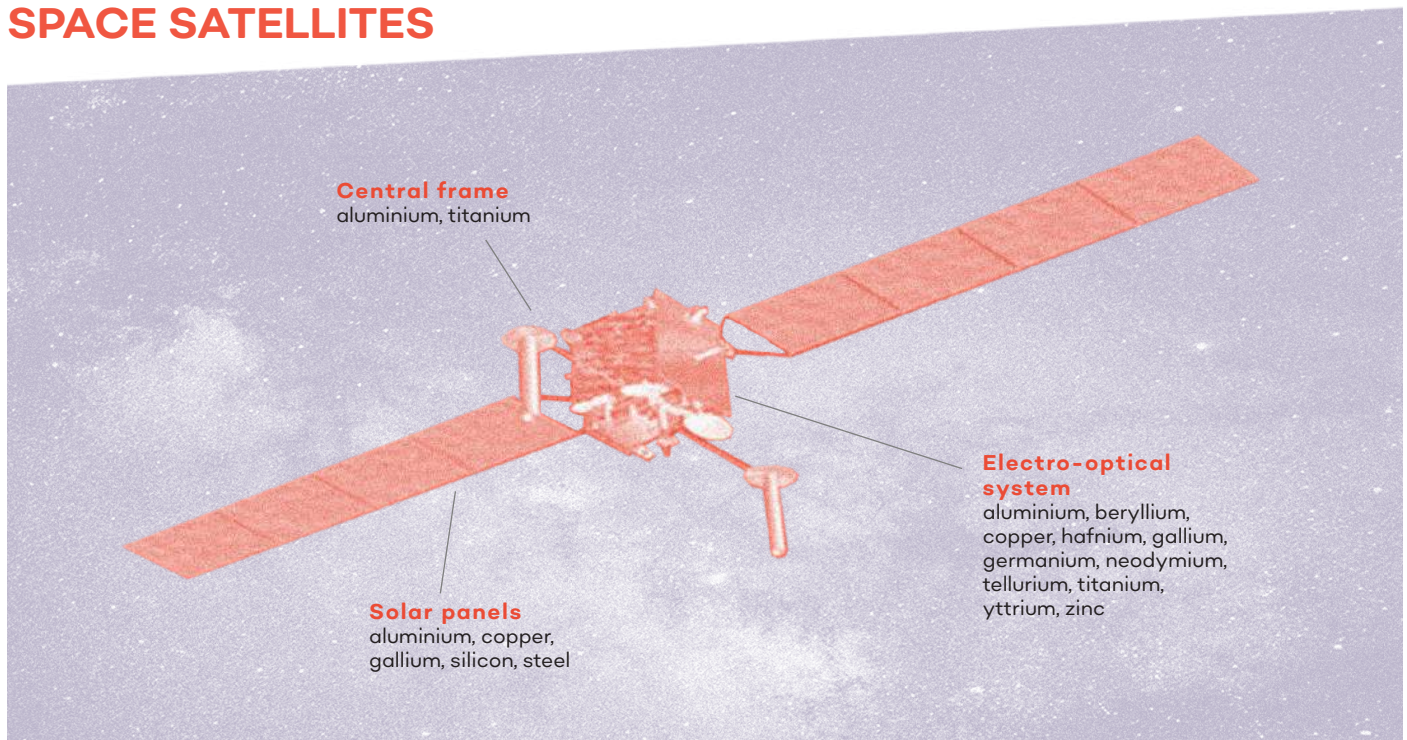
Computer software is equally essential to military cyber operations. American multinational technology company IBM provides integrated software and consultancy services for the MOD’s 4,000 sites, barracks, and land, air and naval bases.⁷⁶ Data mining company Palantir received a £39 million contract from the MOD for a software that “allow(s) warfighters to interact with all of their data from all of their systems.”⁷⁷ This software is also

“mission critical” to Immigration Custom Enforcement in the US, widely repudiated for mass family separation, detention and deportation.⁷⁸

Movement to “digitis(e) warfare in the information age” is underway in the MOD, including the increasing use of analytics, artificial intelligence and robotics.⁷⁹ At London’s NATO conference in 2019, a National Cyber Security Strategy spearheaded by GCHQ was promised £1.9 billion in investment.⁸⁰ Since 2000, nine out of the ten chiefs of the country’s security and intelligence agencies have moved on to jobs in this expanding sector.⁸¹ £250 million is reserved for an Offensive Cyber Programme with the intention of becoming a “world leader” in this field.⁸²

The MOD is also undertaking research into how social media and psychological techniques can be “harnessed by the military to influence people’s beliefs.”⁸³ Some of these activities are carried out by GCHQ’s Joint Threat Research Intelligence Group (JTRIG) and the MOD’s secretive 77th Brigade. The latter claims to “counter misinformation,” as part of broader “information wars.”⁸⁴ JTRIG’s explicit aim is to “inject false material onto the internet to destroy the reputation of its targets” and “manipulate online discourse and activism.”⁸⁵

SPACE SATELLITES



Space-based infrastructure has become vital to a range of military activities, with dominance in space increasingly a prerequisite for dominance on earth. **Satellite technologies also provide large data sets, surface readings and high-resolution maps to support building extractive infrastructures on the ground.**⁸⁶

Skynet 5 is the centrepiece of the UK's space presence, a constellation of four satellites that secure military communications and intelligence gathering for British and NATO armed forces.⁸⁷ It has been delivered via a private partnership between Paradigm Secure Communications and Airbus Defence and Space. Three of the satellites were launched from Kourou in French Guiana, a European spaceport in South America. The transition to a sixth generation architecture that will support data links to drones and F-35 aircraft—and adopt new battlefield technologies including artificial intelligence and machine learning applications—under new contracts worth £6 billion, has already begun.⁸⁸

The MOD is also spending £50 million over the next five years on a Space Programme.⁸⁹ This includes a £30 million partnership with Virgin Orbit on the “military uses of small satellites,” part of a strategy to transform

space into a war-fighting domain.⁹⁰ The new RAF Strategy commits to providing “full spectrum air and space power,”⁹¹ which entails close collaboration with the US to “forge new frontiers in space.”⁹² The UK is part of the Five Eyes⁹³ intelligence sharing alliance's Combined Space Operations, and became the first formal partner in the US-led Operation Olympic Defender, aimed at “strengthen(ing) deterrence against hostile actors in space.”⁹⁴

Space is also becoming a frontier for the mining industry. Some governments are implementing programmes and legislation to join the race for minerals such as bauxite, iron, uranium, and rare earth elements in space. The asteroid mining market is now valued at over \$1 trillion.⁹⁵

EXTRACTIVE WARFARE

Fighter aircraft, armoured vehicles, missiles and drones are not assembled and purchased to showcase, but for war, military occupation and policing. In 2018, British armed forces were committed to over 30 operations in at least 25 countries,¹ including a minimum of seven covert wars involving Special Air Service (SAS) operations or US drone strike facilitation.²

All stages of warfare generate significant ecological consequences alongside human devastation, which endure long after the ostensible ‘end’ of a conflict, including resource stockpiling and consumption, water, air and land pollution, destroyed habitats and infrastructures, biodiversity loss and escalating carbon emissions.³ At international forums, the UK has consistently opposed new conventions to protect the environment in relation to armed conflict, while insisting on exemptions for nuclear weapons and refusing to concede a legal linkage between ecological harm and human health.⁴

Military training areas are estimated to encompass 6% of the earth’s surface.⁵ The US alone has over 800 military bases all over the planet.⁶ Britain also has an extensive network of at least 32 garrisons in foreign countries and overseas territories, which are primarily colonial inheritances and cost the government £141.2 million and £48.5 million respectively in 2018.⁷ Plans have been discussed to open “new military bases around the world” after Britain’s exit from the European Union, from the Caribbean to the South China Sea.⁸ Military bases typically store vehicles, weapons and explosives, which are regularly tested or serviced with cyanides, acids and other toxic chemicals.⁹

The UK is the second largest arms exporter, constituting a fifth of total annual sales (over £14 billion), and the fourth highest trader in security equipment (£5.2 billion).¹⁰ In 2019, arms sales to states on the Foreign and Commonwealth Office’s (FCO) ‘human rights priority’ list increased 390% to £849 million.¹¹ Additionally, the UK military officer training

academy Sandhurst has received £40 million in the last decade to train cadets and soldiers from many of these countries.¹²

Relatedly, the UK is responsible for over a third of global corporate tax avoidance a year (£167 billion) through its network of overseas tax havens.¹³ By one estimate, the arms trade accounts for 40% of annual corruption.¹⁴

The MOD emphasises that **military exports and engagements contribute to “assuring the UK’s access to secure and affordable resources” and its status as a global military power.**¹⁵ This includes a significant contribution to UN peacekeeping missions—from South Sudan and Somalia to the Congo and Cyprus—which constitute the “largest environmental footprint in the UN system.”¹⁶ Often addressing conflicts with clear links to resource extraction, these missions mandate the consolidation of state control by “restoring the administration of natural resources” and tackling “illegal exploitation.”¹⁷

This section initiates a cartography of Britain’s military and extractive footprint on the globe, which is dynamic rather than static or complete. By “making domination visible”, these maps can show how UK military operations, bases, trainings and arms sales open and protect local and global markets for London-listed mining companies discussed in the previous sections, as well as “provoke new sites of opposition and political engagement.”¹⁸ As the MOD consumes 1 billion litres of fuel a year to power its operations,¹⁹ additional information regarding the extraction and trade of fossil fuels also features in order to contextualise mining and warfare’s entanglements through the primary energy form that circulates between them.

AMERICAS

CANADA

Originally used for chemical warfare testing during the Second World War,²⁰ Suffield is the UK's largest armoured training facility and holds a permanent contingent of over a hundred British personnel and a thousand vehicles over 2,700 square kilometres of land.²¹

In the same Alberta region, BP has major interests in three oil tar sands fields, part of the world's largest industrial project to extract its most polluting fossil fuel.²² There has been continuous resistance by First Nation communities, land and environmental defenders and water protectors in the face of heavily militarised repression.²³



Key

-  military cooperation (training, arms sales)
-  war
-  mines
-  military base

BELIZE

A sixth of Belize's landmass is used by the British military for live-fire jungle warfare training. This area is "larger than the entire area of land owned by the MOD in the UK" and contains "critically endangered" species as well as rare Mayan archaeological sites. In January 2019, British officials stated that their military objectives in the Caribbean are focused on "developing our footprint in Belize."²⁴



AFRICA

LIBYA

The UK military has played a significant role in the NATO invasion of Libya since 2011. An inquiry by the Foreign Affairs Select Committee concluded that **regime change has led to political and economic collapse and the growth of ISIL in north Africa.**²⁵ There have been reports of widespread human trafficking, extortion and markets in enslaved people.²⁶

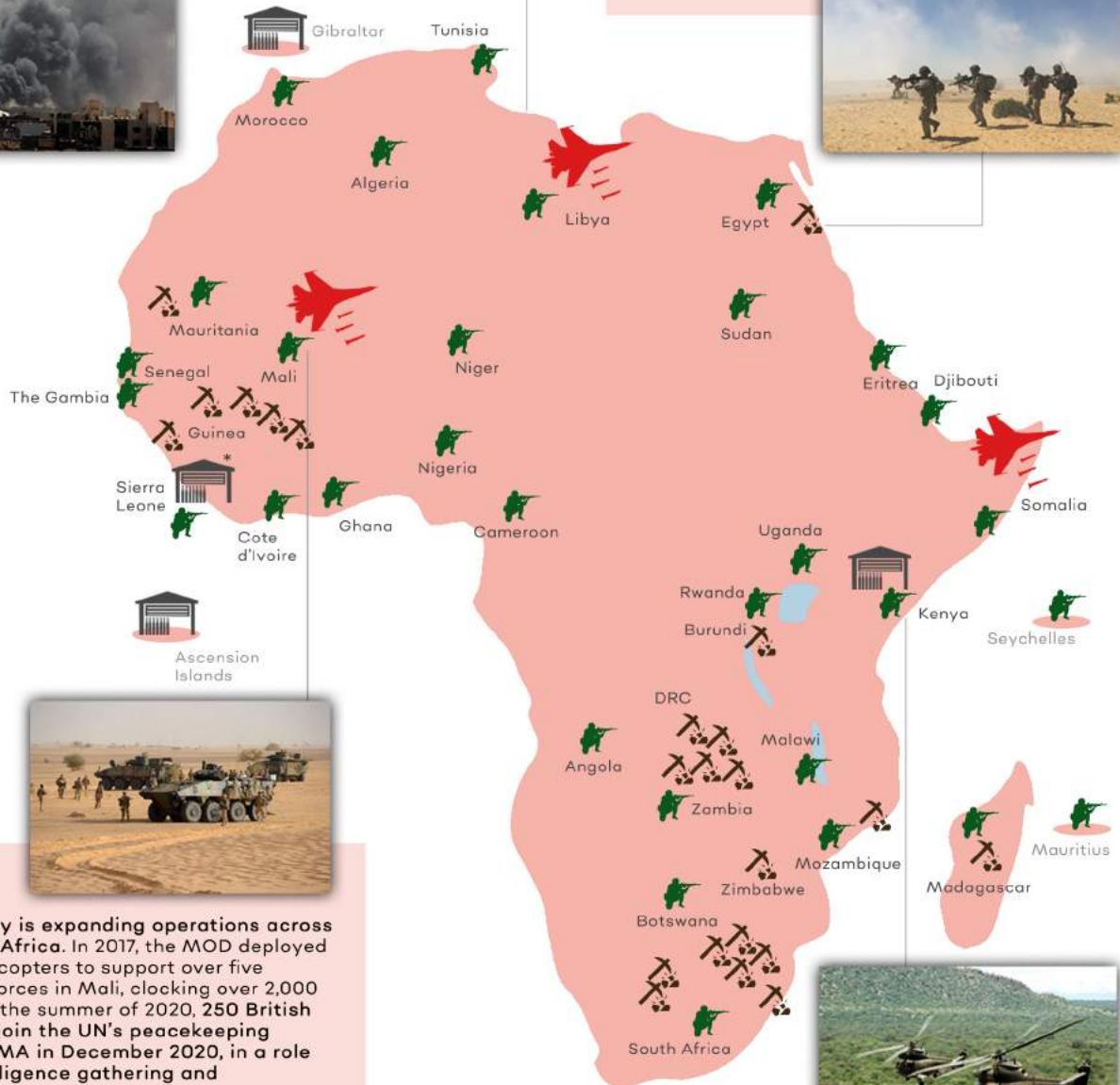
The fortunes of British companies have been far more favourable. **Glencore became the sole beneficiary of a third of the country's vast crude oil production in 2015,** circa 230,000 barrels per day. BP and Shell started to return to Libya from 2017 onwards to share the spoils.²⁷



EGYPT

The current Egyptian regime came to power with a military coup in 2013 and has since disappeared and incarcerated tens of thousands of opponents as well as journalists.³³ Britain continues to deepen its support and collaboration. In March 2019, a "growing military partnership" was marked with a first month-long bilateral training exercise, including 165 British personnel.³⁴

The UK government licensed at least £193 million worth of military exports to Egypt since 2013,³⁵ while BP continues to be the largest foreign investor in the country, responsible for almost 40% of the country's oil production since the 1960s.³⁶ Egypt's former Minister of Industry, Ibrahim Fawzy, sits on the board of London-listed Centamin which operates the massive Sukari gold mine.³⁷



MALI

The British military is expanding operations across the Sahel in west Africa. In 2017, the MOD deployed three Chinook helicopters to support over five thousand French forces in Mali, clocking over 2,000 hours of flying. By the summer of 2020, 250 British troops are set to join the UN's peacekeeping operation MINUSMA in December 2020, in a role emphasising intelligence gathering and reconnaissance.²⁸

UK personnel are heavily involved in training soldiers in the region, leading exercises in Cameroon, Morocco and Nigeria.²⁹ The number of 'violent events' on the African continent increased 1105% in the last decade, as foreign military interventions deepened.³⁰ The Malian military is being investigated for the massacre of 29 villagers in Mopti in June 2020, amid widespread and ongoing protests against the government and foreign military powers.³¹

Several UK-listed mining companies are already profiting from Mali's vast mineral deposits, including gold companies Resolute Mining, Cora Gold and Hummingbird Resources, and Kodal Minerals, the largest lithium developer in the region which is undertaking an "aggressive exploration programme."³²



KENYA

The British army's thirteen training grounds in Nanyuki prepare up to 7,500 troops per year for deployment, with around 100 permanently based personnel.³⁸ Hundreds of Kenyan farmers have been killed or maimed by explosives left on their land by the British army.³⁹

At the UK-Africa Investment Summit in January 2020, Tullow Oil announced another £1.2 billion investment towards its controversial project in the Turkana region.⁴⁰ London-listed mining companies also profit from Kenya's natural resources, including Base Resources' mineral sands operation⁴¹ and gold mining projects by Goldplat,⁴² Red Rock Resources,⁴³ and Shanta Gold.⁴⁴



MIDDLE EAST

IRAQ

Around 1,200 UK troops remain stationed in Iraq. The Royal Air Force has dropped 4,300 missiles on Iraqi cities and villages since 2014 under Operation Shader.⁴⁵ Toxic waste from the military has been linked to significantly elevated rates of cancer and birth defects.⁴⁶ By some estimates, up to 2.4 million Iraqis have died since 2003 as a result of the war.⁴⁷

Before the invasion, British ministers held several meetings with BP and Shell to discuss the exploitation of the country's massive oil reserves. The largest contracts in oil industry history were quickly signed, totalling 60 billion barrels. BP is the primary producer of the third-largest field in the world in Rumaila.⁴⁸



ISRAEL

The UK government licensed military exports worth £429 million to Israel in the last decade which it has used in regular assaults on occupied Palestine.⁴⁹ In return, the MOD bought a fleet of 54 unarmed surveillance Watchkeeper drones from Thales UK and Israel's largest arms company, Elbit Systems, for £1 billion.⁵⁰ In August 2019, the Royal Navy participated in Israel's largest international naval exercise off the Mediterranean shore where it enforces the blockade of Gaza,⁵¹ and an estimated 1 trillion cubic feet of natural gas is being explored by London-listed company Energean.⁵²



SAUDI ARABIA

Since 1985, the Al-Yamamah arms deals between Britain and Saudi Arabia have returned up to 600,000 barrels of crude oil per day to the UK.⁵³ By 2005, BAE Systems had sold £43 billion of weapons in return.

Saudi Arabia's assault on Yemen since 2015 has led to the "world's worst humanitarian crisis."⁵⁴ Due to relentless bombings of residential areas, schools, water supplies, hospitals and marketplaces, hundreds of thousands of Yemenis have been killed by the conflict with millions more at risk of starvation.⁵⁵

In those five years, BAE Systems sold £15 billion in arms and services, including a fleet of 48 Typhoons.⁵⁶ Beyond arms sales, British officers have been present in Saudi war rooms, trained pilots, stored and issued bombs for Saudi aircraft, and maintained warplanes at key operating bases.⁵⁷ Hundreds of Saudi air force and navy personnel train at bases across the UK every year.⁵⁸

QATAR

The Royal Air Force's No.83 Expeditionary Air Group is based at the US military's Al Udeid air base.⁵⁹ BAE Systems is delivering a £6 billion contract to sell 24 Typhoon jets and 9 Hawk trainer aircrafts plus Brimstone missiles to Qatar.⁶⁰ In June 2020, a joint UK-Qatari Typhoon squadron was established at RAF base Coningsby in Lincolnshire as part of the deal.⁶¹

Qatar is the world's largest supplier of liquid natural gas. Shell has a 30% stake in the huge Qatargas 4 field, producing 2.9 billion cubic feet of gas and 70,000 barrels of natural gas liquids per day.⁶² The country's Sovereign Wealth Fund is also a major shareholder in Glencore.⁶³



OMAN

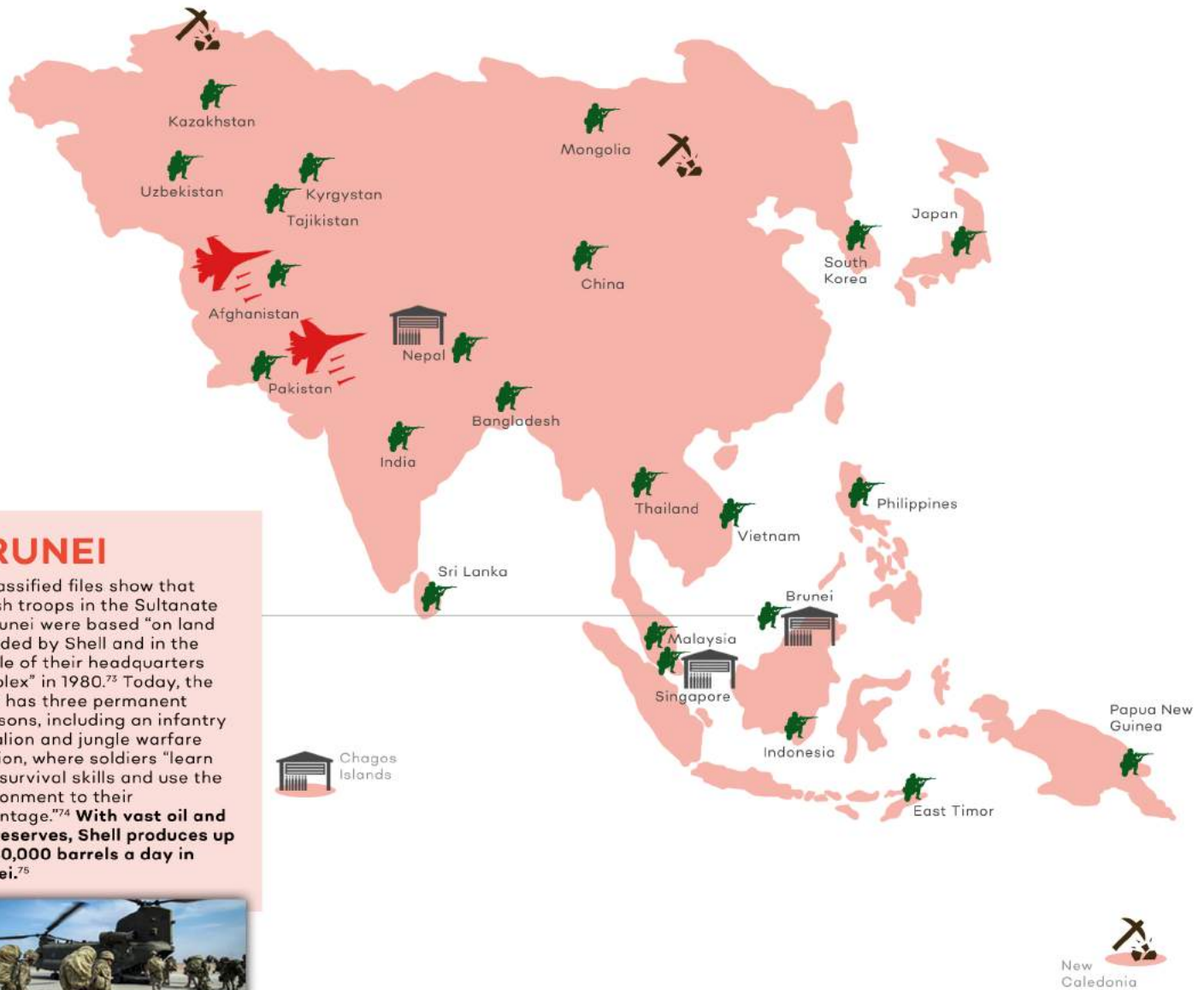
Britain established a permanent Royal Navy base, training facility and key logistics centre around the port of Duqm in 2017.⁶⁴ Oman also hosts three GCHQ spy bases and the BBC World Service radio.⁶⁵

Armed forces collaborate closely together, including the six-month long Swift Sword exercises in 1986, 2001 and 2018 which involve over a thousand vehicles travelling from the UK.⁶⁶ 91 British 'loan service personnel' serve in the Omani army to protect the monarchy from "external and internal threats," the largest contingent provided to any of the UK's allies around the world.⁶⁷

Military equipment is also shared, including Oman's £2.5 billion contract for 12 Typhoon and 8 Hawk aircrafts manufactured by BAE Systems, as well as 38 of the company's Challenger tanks.⁶⁸ Oman has the highest military spending per capita in the world.⁶⁹

In Khazzan, BP owns 60% of the largest onshore gas field in the world,⁷⁰ while Shell owns over a third of Petroleum Development Oman and its 6,000 producing wells.⁷¹ Oman's Sovereign Wealth Fund owns a 37% stake worth £93 million in uranium mining company Berkeley Energia.⁷²

ASIA



REVOLVING DOORS

Away from mining sites and conflict zones, the entanglements between industries of extraction and war also operate through revolving personnel and networks of interest between corporate boardrooms, investment funds and parliament.

The Defence Board, the highest committee in the MOD, includes two high-profile mining executives. The chair of the Defence Audit Committee, **Simon Henry**, spent over thirty years at Shell and is currently a director on the board of Rio Tinto. Former chairman of Rio Tinto and chief executive at Shell, **Paul Skinner**, is now chair of the Defence Equipment and Support Board (DE&S).¹ Two other non-executive directors at DE&S held

or still hold roles in the oil and gas sector, **including Ros Rivaz**, who spent almost two decades at ExxonMobil, and **Iain Lanaghan**, who is Faroe Petroleum's finance director.²

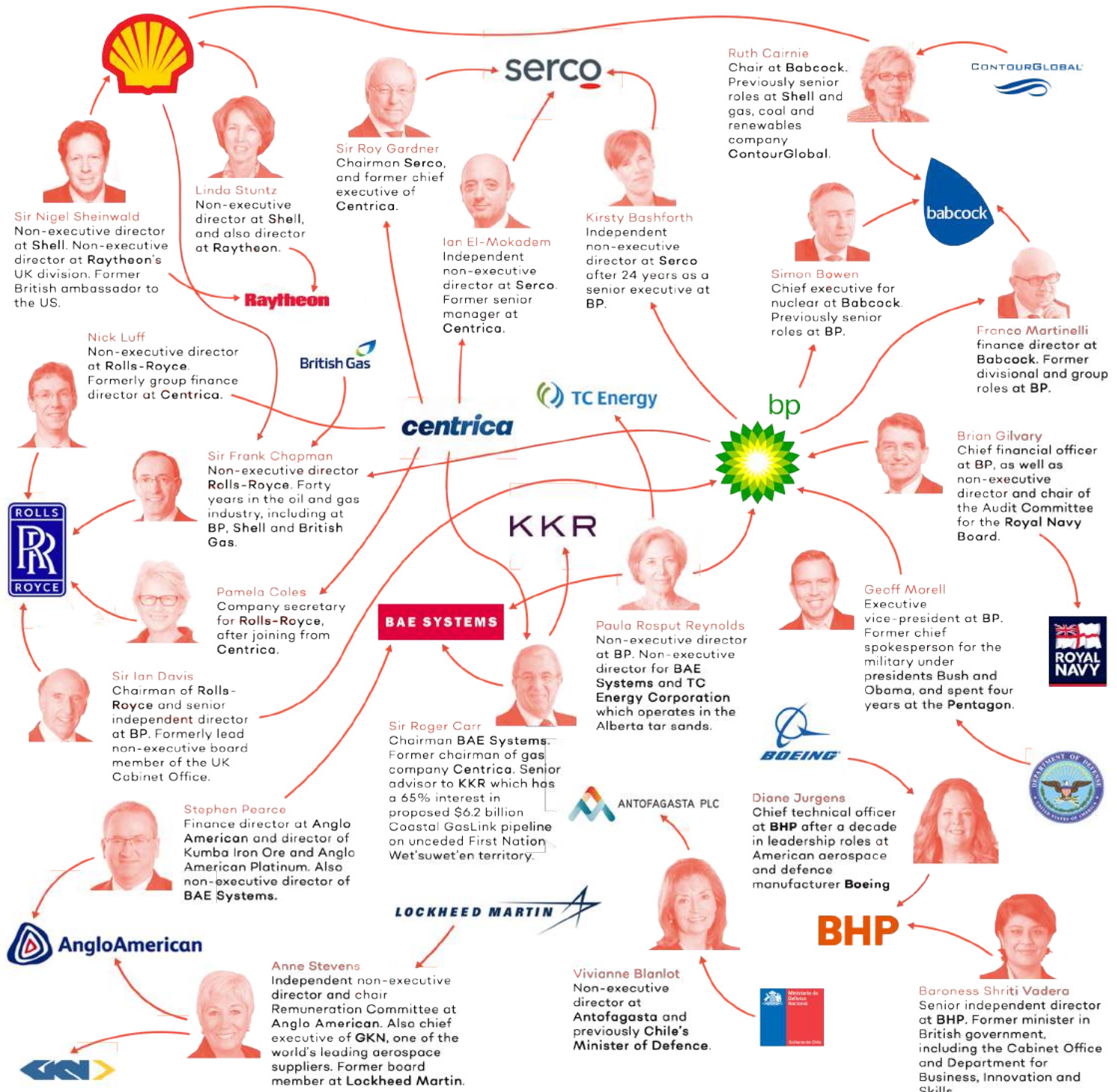
The MOD's Chief Information Officer, **Charles Forte**, spent over two decades in the same role at BP,³ while the **last three heads of the Secret Intelligence Service (MI6) have joined the boards of oil and gas companies.** This includes **John Sawers**, appointed chair of BP's geopolitical committee after being special representative to Iraq at the time of the UK government's invasion.⁴

HOUSE OF LORDS

At least nineteen members of the House of Lords hold shares in mining companies, seven of whom also hold shares in arms companies.⁵ This includes three former justices of the Supreme Court who hold shares in Rio Tinto; one, **Jonathan Mance**, also holds shares in Babcock, BHP, BP and Shell. To highlight more Barons:

- **Michael Bishop**: owns shares in mining companies Evolution Mining, Newmont, Randgold Resources and Lynas Corporation (the largest rare earths mining company outside China). Also shareholder in several arms and security manufacturers: BAE Systems, QinetiQ, Raytheon, Rolls-Royce, and United Technologies
- **Andrew Dunlop**: policy adviser on military procurement, employment and training under Margaret Thatcher, and later a lobbyist for the arms industry including Airbus. Holds shares in Shell and Rio Tinto
- **Michael Farmer**: former treasurer of the Conservatives and founding partner of Red Kite Capital, a specialist metal and mining investment fund. Holds shares in oil companies BP, ExxonMobil and Shell, mining company Cora Gold, and weapons manufacturer General Dynamics
- **Jitesh Gadhia**: major donor to the Conservatives who holds shares in BP, Shell, Glencore and BAE Systems
- **James Lupton**: former treasurer and major donor to the Conservatives with shares in Rio Tinto and Shell, as well as arms and security companies BAE Systems and Biometric Security Holdings
- **James Sassoon**: former commercial secretary to the Treasury under the Coalition government. Holds shares in BHP, Chevron, ConocoPhillips, Rio Tinto and Shell, as well as arms companies BAE Systems and Raytheon
- **Anthony Tudor**: vice-chair of All-Party Parliamentary Group on South Africa and All-Party Africa Group, and chairman of uranium company Yellow Cake⁶

BOARDROOM



STOCK MARKET

Mining and arms companies share a significant number of major shareholders,⁷ mostly via fund management companies who control much of the world's finance capital:⁸

- **Blackrock:** headquartered in the US and the world's biggest investment manager with \$6.5 trillion in assets.
- **Vanguard Group:** headquartered in the US with a portfolio worth over \$5.6 trillion.
- **Capital Group:** headquartered in the US with assets over \$1.86 trillion.
- **Legal & General:** headquartered in London with assets over \$1.32 trillion.

OPENINGS

From shared histories of conquest to ongoing and intensified forms of plunder, industrial resource extraction and warfare have never existed independently from one another, despite the disavowals of their practitioners. Fundamentally, **extractivism is a militarised process**: it violently ruptures ecosystems and habitats. In doing so, it displaces and polices human communities' ongoing relations to the lands being transformed into commodities. Conversely, **militarism is an extractive process**: it depends on vast quantities of natural resources to innovate and assemble more deadly technologies of control and destruction. This is the organising principle of **martial mining**.

This report does not conclude with a reassuring series of policy prescriptions for governments, arms and mining companies, or their investors. Rather, it is intended to generate potential openings for social movements resisting extractivism and militarism to articulate our struggles as shared and indivisible.

It is important to remember these connections have been lived, articulated and resisted for as long as imperial expansion has sought to devastate worlds and ecologies from the Congo to Bougainville, Marikana to Madagascar, Potosí to West Papua. **It remains urgent to honour and renew these legacies and relations of refusal and solidarity on local to global scales.**

On the one hand, **anti-war, anti-militarist and peace movements** can highlight how the military and global arms trade lie at the heart of the climate and ecological crises. **Building on public condemnation of the military's rampant carbon emissions and polluted warzones, this report has indicated the potential in also exposing and targeting the mining companies at the base of global supply chains for weapons production.** Here, it should be emphasised how the global arms trade also fuels militarised mining operations at the sites of extraction.

Furthermore, these movements must be **vigilant and antagonistic towards responses**

to climate change that increase the power and scope of the military and police. These include accelerating efforts to secure elite prosperity behind border walls under drone surveillance, which subject mass movements of people displaced by war and ecological disaster to brutal forms of confinement and repression. It also includes cosmetic developments to 'green the military' and the manipulation of environmental concerns as pretexts for military interventions.

Environmental and climate justice movements, on the other hand, can contest militarism as a praxis of organised violence without which mining and fossil fuel companies would be unable to accumulate profit or expand into new markets. They could strengthen existing demands for the global disarmament of nuclear weapons and an end to the arms trade, emphasising that **each new aircraft and submarine, every military base and invasion, is already a climate catastrophe.**

Today, transnational movements are building around **urgent demands to divert resources from war, repression and policing towards regenerative ecologies of care that not only meet basic human needs for housing, food, health, and education, but restore balance and community with Earth's non-human animals and beings.** This calls for transformative changes, including—but certainly not limited to—expansive reparations of stolen land, wealth and lifeworlds by the states and corporations **most to blame for the climate and ecological crises towards the communities most affected by them.**¹

Dismantling the structures of extractive warfare and imagining and creating just and sustainable worlds are imperatives for collective survival. Through transnational solidarity and collective struggle, many of the histories and social movements evoked in this report can serve as guides towards the immanent possibilities of liberation to which we must continually re-dedicate ourselves.

Thousands of young people on strike from school protest outside Buckingham Palace calling for climate justice, March 2019 Source: Luke Dray/Getty Images

A large crowd of young people is gathered in front of Buckingham Palace for a climate protest. Many protesters are standing on the balustrade of the Victoria Memorial, which features a statue of Queen Victoria. They are holding various handmade signs, including "THERE IS NO PLANET B C", "SEEN AND HEARD", "SYSTEM CHANGE NOT CLIMATE CHANGE", and "12 YEARS". The scene is filled with energy as participants call for climate justice.

ENDNOTES

EXECUTIVE SUMMARY

1. Global Campaign on Military Spending, '2020 Statement: Healthcare not Warfare,' 10 April 2020 http://demilitarize.org/media_news/gdams-2020-april-10-may-9-healthcare-not-warfare/
2. Mark Curtis, 'The UK will spend over £350bn on extravagant military projects while failing to ensure national health security,' *Declassified UK*, 25 March 2020 <https://www.dailymaverick.co.za/article/2020-03-25-the-uk-will-spend-over-350bn-on-extravagant-military-projects-while-failing-to-ensure-national-health-security/>
3. Neta Crawford, 2019. 'Pentagon fuel use, climate change, and the costs of war,' *Watson Institute*
4. Stuart Parkinson, 'The Environmental Impacts of the UK Military Sector,' *Scientists for Global Responsibility and Declassified UK*, May 2020
5. Claudiu Pavel and Evangelos Tzimas, 2016. 'Raw materials in the European defence industry,' JRC Science for Policy Report, European Commission
6. Environmental Justice Atlas, 'Mapping environmental injustice and environmental crime,' accessed 16 July 2020 <https://ejatlas.org/>
7. Lorah Steichen and Lindsay Koshgarian, 'No warming, no war: How militarism fuels the climate crisis—and vice versa,' *Institute for Policy Studies*, April 2020
8. Ministry of Defence, 'Annual Report and Accounts 2018-19,' p.23
9. Mark Curtis and Matt Kennard, 'Britain's seven covert wars: An explainer,' *Declassified UK*, 17 September 2019 <https://www.dailymaverick.co.za/article/2020-02-07-explainer-is-the-uk-a-rogue-state-17-british-policies-violating-domestic-or-international-law/>
10. Richard Zentelis and David Lindenmayer, 2014. 'Bombing for biodiversity—enhancing conservation values of military training areas,' *Conservation Letters*
11. https://en.wikipedia.org/wiki/List_of_British_Army_installations
12. UK Defence & Security Organisation, 'UK Defence & Security Export Statistics for 2018,' *Department for International Trade*, 30 July 2019, p.56.
13. Ministry of Defence, 'Joint Doctrine Note 1/15: Defence Engagement,' August 2015 p.20

INTRODUCTION

1. Harry Cockburn, 'Earth accelerating towards sixth mass extinction event that could see 'disintegration of civilisation,' scientists warn,' *The Independent*, 2 June 2020 <https://www.independent.co.uk/environment/sixth-mass-extinction-endangered-animals-wildlife-markets-biodiversity-crisis-standford-study-a9544856.html>
2. Adam Hanieh, 'This is a global pandemic – Let's treat it as such,' *Verso*, 27 March 2020 <https://www.versobooks.com/blogs/4623-this-is-a-global-pandemic-let-s-treat-it-as-such>
3. Global Campaign on Military Spending, '2020 Statement: Healthcare not Warfare,' 10 April 2020 http://demilitarize.org/media_news/gdams-2020-april-10-may-9-healthcare-not-warfare/
4. UK Cabinet Office, 'The National Security Strategy of the United Kingdom: security in an interdependent world,' March 2008, p.18
5. Mark Curtis, 'The UK will spend over £350bn on extravagant military projects while failing to ensure national health security,' *Declassified UK*, 25 March 2020 <https://www.dailymaverick.co.za/article/2020-03-25-the-uk-will-spend-over-350bn-on-extravagant-military-projects-while-failing-to-ensure-national-health-security/>

6. Neta Crawford, 2019. 'Pentagon fuel use, climate change, and the costs of war,' *Watson Institute*
7. Tamara Lorincz, 2014. 'Demilitarization for deep decarbonisation: Reducing militarism and military expenditures to invest in the UN Green Climate Fund and to create low-carbon economies and resilient communities,' *International Peace Bureau*, Draft Working Paper
8. Macarena Gómez-Barris, 2017. *The Extractive Zone: Social Ecologies and Decolonial Perspectives*
9. War on Want, 2019. 'The Rivers are Bleeding: British mining in Latin America,' p.5
10. see Jairus Grove, 2019. *Savage Ecology: War and Geopolitics at the End of the World*; and Alison Howell, 2018. 'Forget 'militarization': race, disability and the 'martial politics of the police and of the university,' *International Feminist Journal of Politics*, 20(2), p.117-136

COLONIAL MINES AND MILITARY EMPIRES: ORIGINS OF LONDON'S MINING GIANTS

1. Eugenia Herbert, 1984. *Red Gold of Africa: Copper in Precolonial History and Culture*; Kuntala Lahiri-Dutt, 2018. *Between the Plough and the Pick: Informal, Artisanal and Small-scale Mining in the Contemporary World*; Peter Schmidt, 1997. *Iron Technology in East Africa: Symbolism, Science and Archaeology*; Nicholas Tripcevich and Kevin Vaughn (eds), 2013. *Mining and Quarrying in the Ancient Andes*.
2. see Gordan Corrigan, 2014. *A Great and Glorious Adventure: A Military History of the Hundred Years War*; Anne Currey, 2002. *The Hundred Years' War: 1337-1453*; David Green, 2014. *The Hundred Years War: A People's History*.
3. Raj Patel and Jason Moore, 2018. *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature and the Future of the Planet*, p.11-13
4. for more on the racialisation of Europe's peasantry, see Cedric Robinson, 1983. *Black Marxism: The Making of the Black Radical Tradition*.
5. Patel and Moore, 2018. *A History of the World in Seven Cheap Things*, p.14
6. for more on the inception of European conquest and colonialism, see Katherine McKittrick (ed.), 2015. *Sylvia Wynter: On Being Human as Praxis*; Tiffany Lethabo King, 2019. *The Black Shoals: Offshore Formations of Black and Native Studies*.
7. Alexander Koch, Chris Brierley, Mark Maslin and Simon Lewis, 'European colonisation of the Americas killed 10% of world population and caused global cooling,' *The Conversation*, 31 January 2019 <https://theconversation.com/european-colonisation-of-the-americas-killed-10-of-world-population-and-caused-global-cooling-110549>
8. Kathryn Yussof, 2018. *A Billion Black Anthropocenes or None*, p.49
9. Jairus Grove, 2019. *Savage Ecology*, p.83-90
10. Satia, 2019. *Empire of Guns*, p.6
11. Priya Satia, 2019. *Empire of Guns: the Violent Making of the Industrial Revolution*, p.125 and p.141
12. Satia, 2019. *Empire of Guns*, p.2 and p.101
13. Grove 2019. *Savage Ecology*; Priya Satia, 2019. *Empire of Guns*
14. Yussof, 2018. *A Billion Black Anthropocenes or None*, p.49
15. see CLR James, 1938. *The Black Jacobins*, Cedric Robinson, 1983. *Black Marxism: The Making of the Black Radical Tradition*; Saidiya Hartman, 1997. *Scenes of Subjection: Terror, Slavery and Self-Making in Nineteenth-Century America*; and Nick Estes, 2019. *Our History is the Future: Standing Rock Versus the Dakota Access Pipeline, and the Long Tradition of Indigenous Resistance*.

16. Kris Manjapra, 'When will Britain face up to its crimes against humanity?' *The Guardian*, 29 March 2018 <https://www.theguardian.com/news/2018/mar/29/slavery-abolition-compensation-when-will-britain-face-up-to-its-crimes-against-humanity>
17. Catherine Hall, Nicholas Draper, Keith McClelland, Katie Donington and Rachel Lang, 2016. *Legacies of British Slave-Ownership: Colonial Slavery and the Formation of Victorian Britain*.
18. Paul Daley, 'Colonial Australia's foundation is stained with the profits of British slavery,' *The Guardian*, 21 September 2018 <https://www.theguardian.com/world/2018/sep/21/colonial-australias-foundation-is-stained-with-the-profits-of-british-slavery>
19. Geoffrey Blainey, 'A brief history of BHP Billiton,' *Journal of Australasian Mining History*, September 2010; Cerdiwen Dovey, 'The mapping of massacres,' 7 December 2017, *The New Yorker* <https://www.newyorker.com/culture/culture-desk/mapping-massacres>
20. Department of Planning, Industry and Environment, 'New South Wales – Aboriginal Occupation' <https://www.environment.nsw.gov.au/bioregions/BioregionsNswoutlineAboriginalWestern.htm>
21. Lorena Allam and Calla Wahlquist, 'BHP to destroy at least 40 Aboriginal sites, up to 15,000 years old, to expand Pilbara mine,' *The Guardian*, 10 June 2020 <https://www.theguardian.com/business/2020/jun/11/bhp-to-destroy-at-least-40-aboriginal-sites-up-to-15000-years-old-to-expand-pilbara-mine>
22. Blainey, 'A brief history of BHP Billiton,' *Journal of Australasian Mining History*, September 2010
23. Gavin Capps, 'Lonmin in context: The political economy of the South African platinum industry,' in Maren Grimm, Jakob Krameritsch and Britta Becker (eds.), 2018. *Business as Usual After Marikana: Corporate Power and Human Rights*, p.85
24. for more on the migrant labour system, and particularly its gendered impacts, see Asanda Benya, 2017. 'Women of the mines: apartheid and post-apartheid lived realities of South African women,' *Storia delle Donne*, 13, p.79-101; and Asanda Benya and Judy Seidman, 2018. 'There is no change in Marikana: the perspective of women,' in Grimm, Krameritsch and Becker (eds.), 2018. *Business as Usual After Marikana*, p.85
25. see Kerima Mohideen and Richard Harkinson, 'London's mining history, from colonialism to apartheid: why Rhodes Must Fall,' *London Mining Network*, 10 February 2016 <https://londonminingnetwork.org/2016/02/londons-mining-history-from-colonialism-to-apartheid-why-rhodes-must-fall/>
26. Anglo American, 'Complete History,' accessed 12 June 2020, <https://www.angloamerican.com/about-us/history#/EN/category-complete-history/>
27. Extract and Annexes from Minutes of Meeting of the Ministerial Group on Southern Africa, 11 July 1978, United Kingdom National Archive (Defence, 1978, Possible Measures Against SA)
28. Hennie van Vuuren, 2018. *Apartheid, Guns and Money: A Tale of Profit*, p.363
29. Van Vuuren, 2018. *Apartheid, Guns and Money*, p.375
30. Philip Mattera, 'Anglo American,' Corporate Research Project, accessed 15 June 2020 <https://www.corp-research.org/Anglo-American>
31. Rio Tinto, 'History,' accessed 12 June 2020, <https://www.riotinto.com/about/business/history>
32. Charles Harvey, 1981. *The Rio Tinto Company: An economic history of a leading international mining concern, 1873-1954*.
33. Gabrielle Hecht, 2014. *Being Nuclear: Africans and the Global Uranium Trade*, p.96-7
34. United Nations General Assembly, 'Report of the Panel for Hearings on Namibian Uranium. Part Two: Verbatim Transcripts of the Panel Held at Headquarters from 7 to 11 July 1980,' A/AC.131/L.163 (United Nations, 30 September 1980), p.177-182
35. Quoted in Alastair Macfarlane, *Labour Control: Managerial Strategies in the Namibian Mining Sector*, PhD thesis, Oxford Polytechnic, 1990, p.420
36. Hecht, 2014. *Being Nuclear*, p.82
37. Hecht, 2014. *Being Nuclear*, p.3

MILITARISED MINING

1. Claudiu Pavel and Evangelos Tzimas, 2016. 'Raw materials in the European defence industry,' JRC Science for Policy Report, European Commission
2. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,'
3. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' JRC Science for Policy Report, p.4
4. Jonathan Watts, 'Resource extraction responsible for half world's carbon emissions,' *The Guardian*, 12 March 2019 <https://www.theguardian.com/environment/2019/mar/12/resource-extraction-carbon-emissions-biodiversity-loss?>
5. Earthworks and Oxfam America, 2004. *Dirty Metals: Mining, Communities and the Environment*
6. Richard Harkinson, *London Mining Network*
7. Gabriel de Sá, 'Brazil's deadly dam disaster may have been preventable,' *National Geographic*, 29 January 2019 <https://www.nationalgeographic.com/environment/2019/01/brazil-brumadinho-mine-tailings-dam-disaster-could-have-been-avoided-say-environmentalists/>
8. Stephen Tuffnell, 'Acid drainage: the global environmental crisis you've never heard of,' *The Conversation*, 5 September 2017 <https://www.independent.co.uk/environment/acid-drainage-gold-mining-romania-rosia-montana-cyanide-pollution-ecological-disaster-a7931686.html>
9. Damian Carrington, '\$10bn of precious metals dumped each year in electronic waste, says UN,' *The Guardian*, 2 July 2020 <https://www.theguardian.com/environment/2020/jul/02/10bn-precious-metals-dumped-each-year-electronic-waste-un-toxic-e-waste-polluting>
10. Environmental Justice Atlas, 'Mapping environmental injustice and environmental crime,' accessed 16 July 2020 <https://ejatlas.org/>
11. War on Want, 'Mercenaries Unleashed: The brave new world of private military and security companies,' January 2016, p.7
12. Global Witness, 'Defending tomorrow: The climate crisis and threats against land and environmental defenders,' July 2020 <https://www.globalwitness.org/en/campaigns/environmental-activists/defending-tomorrow/>
13. Robert Ayres, John Holmberg and Bjorn Andersson, 'Materials and the global environment: Waste mining in the 21st century,' *MRS Bulletin*, June 2001
14. Robert Booth, 'Grenfell cladding maker 'knew it fell below safety standard,' *The Guardian*, 27 January 2020 <https://www.theguardian.com/uk-news/2020/jan/27/grenfell-tower-inquiry-companies-passing-the-buck-on-responsibility>
15. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.44; and Statista, 'Global end use of primary aluminium by sector 2019,' 6 May 2020 <https://www.statista.com/statistics/280983/share-of-aluminum-consumption-by-sector/>
16. Rio Tinto, 'Annual Report 2019,' p.5, accessed 12 June 2020
17. South 32, 'Annual Report 2019,' p.30, accessed 12 June 2020
18. <https://www.glencore.com/what-we-do/metals-and-minerals/other-metals-and-minerals>

19. En+ Group, 'EN+ GROUP PLC announces the completion of the first stage of the securities exchange agreement with certain subsidiaries of Glencore plc,' 1 February 2019 https://www.enplusgroup.com/en/investors/regulatory-news-service-and-filings/en-group-plc-announces-the-completion-of-the-first-stage-of-the-securities-exchange-agreement-with-c/?sphrase_id=6376
20. Reuters, 'Rusal, Glencore strike aluminium deal worth up to \$16.3bn,' *Mining.com* <https://www.mining.com/web/rusal-glencore-agree-aluminium-deal-worth-up-to-16-3bn/>
21. M.Garside, 'Major countries based on cobalt reserves 2019,' Statista, 11 February 2020 <https://www.statista.com/statistics/264930/global-cobalt-reserves/>
22. Adam Hochschild, 2012. *King Leopold's Ghost: A Story of Greed, Terror and Heroism in Central Africa*.
23. Gordon Corera, 'MI6 and the death of Patrice Lumumba,' *BBC News*, 2 April 2013 <https://www.bbc.co.uk/news/world-africa-22006446>; see also Leo Zeilig, 2015. *Lumumba: Africa's Lost Leader*.
24. Filip Reyntjens, 2004. 'Rwanda, ten years on: From genocide to dictatorship,' *African Affairs*, 103(411), p.177-210
25. Glencore, 'Annual Report 2019,' p.224; <https://copperbeltkatangamining.com/glencore-de-lists-giant-katanga-mining/>
26. Amnesty International and Afreewatch, 'This is what we die for: Human rights abuses in the Democratic Republic of the Congo power the global trade in cobalt,' 19 January 2016 <https://www.amnesty.org/en/documents/afr62/3183/2016/en/>
27. Siddharth Kara, 'Is your phone tainted by the misery of the 35,000 children in Congo's mines?' *The Guardian*, 12 October 2018 <https://www.theguardian.com/global-development/2018/oct/12/phone-misery-children-congo-cobalt-mines-drc>
28. William Clowes and Felix Njini, 'Death toll at Glencore's mine puts spotlight on illegal mining,' *Bloomberg*, 28 June 2019 <https://www.bloomberg.com/news/articles/2019-06-28/death-toll-at-glencore-s-mine-puts-spotlight-on-illegal-mining>
29. Esther de Haan and Vincent Kiezebrink, 'Cobalt blues: Environmental pollution and human rights violations in Katanga's copper and cobalt mines,' 1 April 2016, p.26
30. Environmental Justice Atlas, 'Glencore-Katanga Mining Ltd., Democratic Republic of Congo (DRC),' accessed 12 June 2020 <https://ejatlas.org/conflict/glencore-katanga-mining-ltd-in-the-democratic-republic-of-congo-drc>
31. Ministry of Defence, 'Ministry of Defence Annual Report and Accounts, 2018-19,' p.43
32. BBC News, 'DR Congo: UN peacekeepers face fresh sexual abuse claims,' 28 April 2017, accessed 12 June 2020 <https://www.bbc.co.uk/news/world-africa-39745357>, and UN News, 'Peacekeepers' sexual abuse of local girls continuing in DR of Congo, UN finds,' 7 January 2005
33. United Nations Environment Programme, 'Greening the Blue Helmets: Environment, Natural Resources and UN peacekeeping operations,' May 2012, p.49-51
34. Ben Doherty, Petra Blum and Oliver Zihlmann, 'The inside story of Glencore's hidden dealings in DRC,' *The Guardian*, 5 November 2017 <https://www.theguardian.com/business/2017/nov/05/the-inside-story-of-glencore-hidden-dealings-in-drc>
35. Cobalt Institute, 'The World of Cobalt: The Technology Enabling Material,' p.6
36. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.45
37. Glencore, 'Annual Report 2019,' p.72, accessed 12 June 2020
38. Power Metal Resources, 'Seeking large scale mineral deposits,' Presentation, May 2020
39. Red Rock Resources, 'Copper-Cobalt,' accessed 12 June 2020, <https://www.rrrplc.com/projects-and-investments/copper-cobalt/>
40. Arc Minerals, 'About us,' accessed 12 June 2020, <http://www.arcminerals.com/about-us/default.aspx>
41. Horizonte Minerals, 'Horizonte Minerals Investor Presentation: Leading nickel development company,' 2019, accessed 12 June 2020 https://horizonteminerals.com/news/en_20191024-investor-presentation.pdf
42. Regency Mines, 'Operations and Investments: Mambare,' accessed 12 June 2020, <https://www.regency-mines.com/operations-and-investments/mining-and-minerals/mambare/>
43. Earthworks and Oxfam America, 2004. *Dirty Metals: Mining, Communities and the Environment*, p.4
44. US Geological Survey, 'Rhenium Statistics and Information,' National Minerals Information Centre, accessed 12 June 2020
45. LibreTexts, 'Chemistry of Tellurium,' *Inorganic Chemistry*
46. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.45, and Copper Alliance, 'Stocks and Flows,' accessed 12 June 2020 <https://copperalliance.org/about-copper/stocks-and-flows/>
47. BHP, 'Annual Report 2018,' p.7, accessed 12 June 2020
48. Glencore, 'Metals & Minerals: Copper,' accessed 12 June 2020 <https://www.glencore.com/what-we-do/metals-and-minerals/copper>
49. Antofagasta, 'Annual Report 2019,' p.2, accessed 12 June 2020
50. First Quantum Minerals, 'Annual Report 2019,' p.7, accessed 12 June 2020
51. Anglo American, 'Annual Report 2019,' p.2, accessed 12 June 2020
52. Reuters, 'US copper frenzy grows as Rio Tinto plans \$1.5 billion Utah mine expansion,' *Mining.com*, 3 December 2019 <https://www.mining.com/web/us-copper-frenzy-grows-as-rio-tinto-plans-1-5bn-utah-mine-expansion/>
53. Lydia Noon, 'Communities demanding redress from Rio Tinto,' *London Mining Network*, 1 April 2020
54. London Mining Network, 'Cut and run: How Britain's top mining companies have wrecked ecosystems without being held to account,' p.14, February 2020
55. Kristian Lasslett, 2015. *State Crime on the Margins of Empire: Rio Tinto, the War on Bougainville and Resistance to Mining*. Pluto Press
56. Sinclair Dinnen, 'Money, guns and politics – Mercenary times in Papua New Guinea,' *Contemporary Comments*, November 1997; and Lasslett, 2015. *State Crime on the Margins of Empire*. Pluto Press
57. Noon, 'Communities demanding redress from Rio Tinto,' *London Mining Network*, 1 April 2020
58. Ben Doherty, 'Rio Tinto accused of violating human rights in Bougainville for not cleaning up Panguna mine,' *The Guardian*, 31 March 2020 <https://www.theguardian.com/world/2020/apr/01/rio-tinto-accused-of-violating-human-rights-in-bougainville-for-not-cleaning-up-panguna-mine?>
59. Eugene Cairncross, 'Health and environmental impacts of platinum mining: Report from South Africa,' March 2014
60. World Platinum Investment Council, 'Platinum: Diverse drivers of demand,' accessed 12 June 2020, and Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.48
61. Anglo American, 'Annual Report 2019,' p.2
62. Tharisa, 'Integrated Annual Report 2019,' p.37
63. <http://www.sylvaniaplatinum.com/>, accessed 12 June 2020
64. <https://jubileemetalsgroup.com/>, accessed 12 June 2020
65. European Commission 2012. 'Blue Growth: opportunities for marine and maritime sustainable growth.'
66. Engineering and Physical Sciences Research Council, 'About Us: People,' accessed 13 June 2020
67. SoS MinErals, 'Projects,' accessed 20 August 2020 <https://www.bgs.ac.uk/sosminerals/projects.html>
68. Tommy Humphreys, 'Mining's Tesla moment: DeepGreen harvests clean metals from the seafloor,' *Mining.com*,

- 5 June 2017 <https://www.mining.com/web/minings-tesla-moment-deepgreen-harvests-clean-metals-seafloor/>
69. David Shukman, 'UK Seabed Resources joins deep-ocean mineral-mining rush,' BBC News, 14 March 2013 <https://www.bbc.co.uk/news/science-environment-21774447>
 70. Environmental Audit Committee, 2018. 'Oral evidence: Sustainable seas, HC 980. Q350-353 answered by Christopher Williams,' 16 October 2018
 71. Andy Higginbottom, 2018. 'The Marikana massacre in South Africa: the results of toxic collusion,' XVIII Congreso Colombiana de Historia
 72. Lonmin, 2014. 'Exhibit VVVVI: Bundle of Emails in Evidence of Albert Jamieson,' Centurion SA: Farlam Commission, p.1-8
 73. Lonmin, 2014. 'Exhibit VVVVI: Bundle of Emails in Evidence of Albert Jamieson,' Centurion SA: Farlam Commission, p.55
 74. Greg Marinovich, 2017. *Murder at Small Kopie: The Real Story of South Africa's Marikana Massacre*, p.176
 75. Higginbottom, 2018. 'The Marikana massacre in South Africa.'
 76. Campaign Against Arms Trade, 'UK Arms Export Licenses: South Africa since 2010,' accessed 12 June 2020
 77. Campaign Against Arms Trade, 'Corruption Investigations: BAE Systems, South Africa,' accessed 12 June 2020, <https://www.caat.org.uk/resources/companies/bae-systems/investigations/south-africa>
 78. Phil Miller, 'Exclusive: The British army's secret plan to prop up South Africa's ruling party,' *Vice*, 16 May 2016 https://www.vice.com/en_uk/article/kwke4n/exclusive-the-british-armys-secret-plan-to-prop-up-south-africas-ruling-party
 79. Hal Rhoades, 'Mining, money and murder: the deadly struggle to protect South Africa's Wild Coast,' *The Ecologist*, 12 May 2016 <https://theecologist.org/2016/may/12/mining-money-and-murder-deadly-struggle-protect-south-africas-wild-coast>
 80. Rob Nixon, 2013. *Slow Violence and the Environmentalism of the Poor*. Harvard University Press
 81. Bench Marks Foundation, 'Coping with unsustainability, Policy Gap 7, Lonmin 2003-2012,' October 2013
 82. Farlam Commission, 2015. 'Marikana Commission of Inquiry: Report on matters of public, national and international concern arising out of the tragic incidents at the Lonmin mine in Marikana, in the North West Province,' Centurion SA: Farlam Commission, p.522-42
 83. Dick Forslund, 2015. 'The Bermuda connection: Profit shifting, inequality and unaffordability at Lonmin 1999-2012,' *Alternative Information and Development Centre*
 84. Lydia Noon, 'Lonmin's profits rise as Marikana community continues to suffer,' *London Mining Network*, 26 March 2019 <https://londonminingnetwork.org/2019/03/press-release-lonmins-profits-rise-as-marikana-community-continues-to-suffer/>
 85. Matshepo Sehloho, '21 deaths at Sibanye-Stillwater mine in 6 months,' *7Q2*, 26 June 2018 <https://www.702.co.za/articles/309241/21-deaths-at-sibanye-stillwater-mine-in-6-months>
 86. BASF. 'Annual Report 2019,' p.13
 87. Earthworks and Oxfam America, 2004. *Dirty Metals*, p.4
 88. 'Silver processing,' *Britannica*, accessed 13 June 2020 <https://www.britannica.com/technology/silver-processing>
 89. World Gold Council, 'Gold market structure and flows,' accessed 13 June 2020 <https://www.gold.org/about-gold/market-structure-and-flows>
 90. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' and Statista, 'Global silver demand in 2018 by end use,' accessed 13 June 2020 <https://www.statista.com/statistics/253345/global-silver-demand-by-purpose/>
 91. Fresnillo, 'Annual Report and Accounts 2018,' accessed 13 June 2020, p.1
 92. Centamin, 'About Us,' accessed 13 June 2020 <https://www.centamin.com/about-us/what-we-do>
 93. Resolute Mining, 'Company Overview,' accessed 13 June 2020 <https://www.rml.com.au/>
 94. Antofagasta, 'Annual Report 2019,' p.2, accessed 13 June 2020
 95. Hochschild Mining, 'About Us: Overview,' accessed 13 June 2020 http://www.hochschildmining.com/en/about_us
 96. South 32, 'Annual Report 2019,' p.35, accessed 13 June 2020
 97. First Quantum Minerals, 'Annual Report 2019,' accessed 13 June 2020, p.7
 98. Pan African Resources, 'What we do,' accessed 13 June 2020 <https://www.panafricanresources.com/>
 99. Hummingbird Resources, 'Annual Report & Accounts 2019,' accessed 13 June 2020, p.6
 100. Kylie McKenna, 2016. *Corporate Social Responsibility and Natural Resource Conflict*, p.172
 101. London Mining Network, 'Cut and run,' p.23, February 2020
 102. Jane Perlez and Raymond Bonner, 'Below a mountain of wealth, a river of waste,' *The New York Times*, 27 December 2005 https://www.nytimes.com/2005/12/27/world/asia/below-a-mountain-of-wealth-a-river-of-waste.html?_r=1
 103. Perlez and Bonner, 'Below a mountain of wealth, a river of waste,' *The New York Times*, 27 December 2005
 104. Campaign Against Arms Trade, 'UK Arms Export Licenses: Indonesia since 2010,' accessed 13 June 2020
 105. Radio New Zealand, 'West Papuans call for closure of Freeport gold mine,' 24 November 2017 <https://www.rnz.co.nz/international/pacific-news/344637/west-papuans-call-for-closure-of-freeport-gold-mine>
 106. see Eben Kirksey and Andreas Harsono, 2008. 'Criminal collaborations?: Antonius Wamang and the Indonesian military in Timika,' *South East Asia Research*
 107. London Mining Network, 'Cut and run,' p.20, February 2020
 108. Connor Woodman, 'Sacrifice Zone: BP, Freeport and the West Papuan independence struggle,' *New Internationalist*, 1 May 2017 <https://newint.org/features/2017/05/01/sacrifice-zone-west-papuan-independence-struggle#fn6>
 109. Rainbow Rare Earths, 'Developing a long-term strategic source of Rare Earths,' January 2020, p.25
 110. British Geological Survey, 'Achievements of the Security of Supply of Mineral Resources Programme,' accessed 13 June 2020, 7:45-8:03, https://www.youtube.com/watch?time_continue=490&v=KCsANKTHXMg&feature=emb_title
 111. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.49
 112. Rainbow Rare Earths, 'About Us,' accessed 13 June 2020 <http://rainbowrareearths.com/about-us/>
 113. Deutsche Welle, 'Israel arrests Netanyahu allies over German submarine deal,' 11 July 2017 <https://www.dw.com/en/israel-arrests-netanyahu-allies-over-german-submarine-deal/a-39639044>
 114. Campaign Against Arms Trade, 'Thyssenkrupp: Overview,' accessed 13 June 2020 <https://www.caat.org.uk/resources/companies/thyssenkrupp>
 115. Premier African Minerals, 'Katete REE Project,' accessed 13 June 2020 <https://www.premierafricanminerals.com/projects/zimbabwe>
 116. Mkango Resources, 'Corporate Information,' accessed 13 June 2020 <https://www.mkango.ca/corporate/overview/>
 117. Ernest Scheyder and Zandi Shabalala, 'Exclusive: Pentagon eyes rare earth supplies in Africa in push away from China,' *Reuters*, 5 June 2019 <https://www.reuters.com/article/us-usa-rareearths-pentagon-exclusive-idUSKCNIT62S4>
 118. Cadence Minerals, 'Yangibana Rare Earth Project,' accessed 13 June 2020 <http://www.cadenceminerals.com/projects/yangibana-rare-earth-project-2/>

119. see Laleh Khalili, 2013. *Time in the Shadows: Confinement in Counterinsurgencies*. Stanford University Press
120. Alexander Dunlap, 2019. 'Wind, coal and copper: the politics of land grabbing, counterinsurgency, and the social engineering of extraction,' *Globalizations*, 17(4), p.664, and see Field Manual 3-24, 'Insurgencies and Countering Insurgencies,' *Department of the Army*, May 2014
121. Ronak Kapadia, 2019. *Insurgent Aesthetics: Security and the Queer Life of the Forever War*. Duke University Press, p.33
122. William Rosenau, Peter Chalk, Renny McPherson, Michelle Parker and Austin Long, 'Corporations and Counterinsurgency,' *RAND Corporation, National Security Research Division*, p.7
123. Glencore, 'Annual Report 2019,' p.89
124. Dunlap, 2019. 'Wind, coal and copper,' *Globalizations*, p.673
125. Rio Tinto, 'Annual Report 2019,' p.95
126. Anglo American, 'Annual Report 2019,' p.2
127. Terence Bell, 'The major applications of steel,' *ThoughtCo*, 7 February 2020 <https://www.thoughtco.com/steel-applications-2340171>
128. Statista, 'Primary nickel consumption worldwide in 2019, by industry,' accessed 13 June 2020 <https://www.statista.com/statistics/693415/nickel-consumption-worldwide-by-industry/>
129. International Lead and Zinc Study Group, 'End Uses of Zinc,' accessed 13 June 2020
130. BHP, 'Our commodities: Metallurgical coal,' accessed 13 June 2020 <https://www.bhp.com/our-businesses/our-commodities/metallurgical-coal/>
131. James Downing, 'Manganese processing,' *Britannica*, accessed 13 June 2020 <https://www.britannica.com/technology/manganese-processing>
132. Britannica, 'Zinc processing: Ores,' accessed 13 June 2020 <https://www.britannica.com/technology/zinc-processing/Ores>
133. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.47-48
134. Rio Tinto, 'Annual Report 2019,' p.5
135. BHP, 'Annual Report 2019,' p.7
136. Glencore, 'Annual Report 2019,' p.65
137. Anglo American, 'Annual Report 2019,' p.3
138. South 32, 'Annual Report 2019,' p.37
139. Stephen Leahy, 'Mines are hotspots for spread of Covid-19, study finds,' *The Guardian*, 5 June 2020 <https://www.theguardian.com/environment/2020/jun/05/mines-coronavirus-hotspots-report-us-canada>
140. Mining Watch, 'Global Solidarity with Communities, Indigenous Peoples and Workers at Risk from Mining Pandemic Profiteers,' 2 June 2020, p.15
141. Mining Watch, 'Voices from the Ground: How the global mining industry is profiting from the COVID-19 Pandemic,' June 2020
142. Jamie Kneen, 'COVID-19: Mining companies putting workers and communities at greater risk,' *Mining Watch*, 31 March 2020 <https://miningwatch.ca/blog/2020/3/31/covid-19-mining-companies-putting-workers-and-communities-greater-risk?>
143. Reuters, 'Peruvian copper mine Antamina reports 210 positive COVID-19 cases,' 27 April 2020 <https://www.reuters.com/article/peru-copper-idUSL2N2CF10E; and Antamina, 'Antamina hará una suspensión temporal de operaciones: Porque no se 42 trata de la mina sino de la salud, seguridad y tranquilidad de todos,' 13 April 2020>
144. Human Rights Watch, 'Peru: Law protects abusive policing,' 12 May 2020 <https://www.hrw.org/news/2020/05/12/peru-law-protects-abusive-policing>
145. Mining Watch, 'Voices from the Ground,' June 2020, p.22
146. Mauricio Angelo, 'Anglo American seeking to mine on indigenous lands in Brazil's Amazon,' *Mongabay*, 31 March 2020
147. Mining Watch, 'Voices from the Ground,' June 2020
148. Terence Bell, 'Titanium properties and characteristics,' *ThoughtCo*, 31 October 2019 <https://www.thoughtco.com/metal-profile-titanium-2340158>
149. R.M. Tyler and R.C.A. Minnitt, 2004. 'A review of sub-Saharan heavy mineral sand deposits: implications for new projects in southern Africa,' *South African Institute of Mining and Metallurgy*
150. Science and Technology Select Committee, 'Inquiry on Strategically Important Metals,' 16 December 2010
151. Somi Seong, Obaid Younossi, and Benjamin Goldsmith, 2009. 'Titanium: Industrial base, price trends and technology initiatives,' *RAND Corporation*, p.27
152. Tyler and Minnitt, 2004. 'A review of sub-Saharan heavy mineral sand deposits,' *South African Institute of Mining and Metallurgy*
153. Ministry of Defence and Defence, Science and Technology Laboratory, 'Porton Down scientists on brink of titanium revolution,' 26 March 2018 <https://www.gov.uk/government/news/porton-down-scientists-on-brink-of-titanium-revolution>
154. Rio Tinto, 'Annual Report 2019,' p.5
155. Bluejay Mining, 'Annual Report and Financial Statements 2019,' p.3
156. Kenmare Resources, '2020 AGM Presentation,' 13 May 2020, p.10
157. British Geological Survey, 'Tungsten,' January 2011
158. International Tungsten Industry Association, 'Tungsten End Use Analysis: 2017,' in W Resources 'Presentation: Low cost tungsten and tin producer,' June 2019, p.7
159. Pavel and Tzimas, 2016. 'Raw materials in the European defence industry,' p.48
160. Cornwall Resources, 'Presentation: Redmoor, Cornwall: a Cornish mine of global significance,' November 2019
161. William Telford, 'Tungsten mine set to reopen after being bought in £2.8m deal,' *Business Live*, 5 December 2019 <https://www.business-live.co.uk/economic-development/tungsten-mine-set-reopen-after-17367777>
162. W Resources, 'Presentation: Low cost tungsten and tin producer – building one of the world's largest tungsten mines,' June 2019
163. <https://www.premierafricanminerals.com/>, accessed 13 June 2020
164. Amber Huff and Yvonne Orengo, 2020. 'Resource warfare, pacification and the spectacle of 'green' development: Logics of violence in engineering extraction in southern Madagascar,' *Political Geography*, 81, p.7
165. Huff and Orengo, 2020. 'Resource warfare, pacification and the spectacle of 'green' development,' p.10
166. Noon, 'Communities demanding redress from Rio Tinto,' *London Mining Network*, 1 April 2020
167. Noon, 'Communities demanding redress from Rio Tinto,' *London Mining Network*, 1 April 2020
168. Vahinala Douguet, 'Madagascar: Local protests against Rio Tinto,' *Environmental Justice Atlas*, 25 January 2013 <http://www.envjustice.org/2013/01/madagascar-local-protests-against-rio-tinto/>
169. Craad-Oi and Tany, 2018. 'The legitimate fight of communities surrounding QMM-Rio Tinto's mining project to claim compensation for their land is repressed again,' *Antananarivo: Centre de Recherches et d'Appui pour les Alternatives de Développement – Ocean Indien et Collectif pour la Defense des Terres Malgaches*
170. Rio Tinto, 2018. 'At the frontline: Security and human rights,' in Huff and Orengo, 2020. 'Resource warfare, pacification and the spectacle of 'green' development,' *Political Geography*, p.10
171. Amnesty International, 'Madagascar: Next government must end human rights violations,' 3 November 2018 <https://www.amnesty.org/en/latest/news/2018/11/madagascar-next-government-must-end-human-rights-violations/>

172. Peter Diehl, 'Uranium mining and milling wastes: An introduction,' 18 May 2011
173. D.A. Holaday, 'Some unsolved problems in uranium mining,' in *Radiological Health and Safety in Mining and Milling of Nuclear Materials: Proceedings*, volume 1 (IAEA, 1964), p.51
174. Hecht, 2014. *Being Nuclear*, p.59
175. BHP, 'Annual Report, 2018,' p.247
176. Statista, 'Rio Tinto's uranium production 2006–2019,' accessed 13 June 2020 <https://www.statista.com/statistics/274239/uranium-production-of-rio-tinto-since-2006/>
177. Rio Tinto, 'Annual Report 2019,' p.39; Rio Tinto, 'Rio Tinto completes sale of its stake in Rössing Uranium Limited,' 16 July 2019 <https://www.riotinto.com/en/news/releases/Rossing-stake-sale-completion#:~:text=Rio%20Tinto%20has%20completed%20the,of%20up%20to%20%24100%20million>
178. World Nuclear Association, 'Uranium and nuclear power in Kazakhstan,' accessed 13 June 2020 <https://www.world-nuclear.org/information-library/country-profiles/countries-g-n/kazakhstan.aspx>
179. World Nuclear News, 'Yellow Cake announces next uranium purchase, 12 April 2019
13. Tossini, 'Britain and nuclear weapons – The Second World War to the 21st century,' *UK Defence Journal*
14. Campaign for Nuclear Disarmament UK, 'Scrap Trident: Cancel the replacement,' November 2019 <https://cnduk.org/resources/stop-trident-facts/>
15. Tossini, 'Britain and nuclear weapons – The Second World War to the 21st century,' *UK Defence Journal*
16. Ministry of Defence, '£330-million sonar contract for Dreadnought submarines,' 28 February 2020 <https://www.gov.uk/government/news/330-million-sonar-contract-for-dreadnought-submarines>
17. Campaign for Nuclear Disarmament UK, 'Security not Trident,' March 2019 <https://cnduk.org/resources/security-not-trident/>
18. see Ash Sarkar, 'By demeaning refugees, Tories have caused the Yarl's Wood hunger strike,' *The Guardian*, 28 February 2019 <https://www.theguardian.com/commentisfree/2018/feb/28/refugees-tories-tyralls-wood-hunger-strike>
19. A. Majeed, 2004. 'The impact of militarism on the environment,' *Physicians for Global Survival*
20. Parkinson, 'The Environmental Impacts of the UK Military Sector,' *Scientists for Global Responsibility and Declassified UK*, May 2020, p.26
21. Parkinson, 'The Environmental Impacts of the UK Military Sector,' *Scientists for Global Responsibility and Declassified UK*, May 2020, p.23

MATERIAL MILITARIES

1. Ministry of Defence, 'Doing Business with Defence: Opportunities and Innovation in the Defence supply chain,' p.4
2. Defence Equipment & Support, 'Who we are,' Ministry of Defence, accessed 13 June 2020 <https://des.mod.uk/who-we-are/>
3. Defence Science and Technology Laboratory, 'Corporate Plan: 2019–24,' Ministry of Defence, p.6
4. Ministry of Defence, and Defence and Security Accelerator, 'MOD Area of Research Interest,' 15 January 2018; and Curtis, 'The UK will spend over £350bn on extravagant military projects while failing to ensure national health security,' *Declassified UK*, 25 March 2020 <https://www.dailymaverick.co.za/article/2020-03-25-the-uk-will-spend-over-350bn-on-extravagant-military-projects-while-failing-to-ensure-national-health-security/>
5. Stuart Parkinson, 'The Environmental Impacts of the UK Military Sector,' *Scientists for Global Responsibility and Declassified UK*, May 2020
6. see Gurinder Shahi and Victor Sidel, 1997. 'The impact of military activities on development, environment, and health,' p.283–312 in Shahi et al (eds.) *International Perspectives on Environment, Development, and Health*. New York: Springer Publishing Company; Martin Donohoe, 2003. 'Causes and health consequences of environmental degradation and social injustice,' *Social Science and Medicine*, p.573–587
7. Minerals Make Life, 'Support our veterans—and the minerals that keep them safe,' *National Mining Association*, 9 November 2018 <https://mineralsmakelife.org/blog/support-our-veterans-and-the-minerals-that-keep-them-safe/>
8. National Mining Association, 'Minerals and metals help improve our national security,' 3 February 2017 <https://nma.org/2017/02/03/minerals-and-metals-help-improve-our-national-security/>
9. Science and Technology Select Committee, 'Inquiry on Strategically Important Metals,' 16 December 2010
10. UK Weapon Reviews, 'Development, concepts and doctrine centre,' *Ministry of Defence*, March 2016
11. SIPRI, 'Trends in world military expenditure, 2019,' *SIPRI Fact Sheet*, April 2020
12. Vitor Tossini, 'Britain and nuclear weapons – The Second World War to the 21st century,' *UK Defence Journal*, 21 January 2019 <https://ukdefencejournal.org.uk/britain-and-nuclear-weapons-the-second-world-war-to-the-21st-century/>
22. Lockheed Martin, 'F-35 Lightning II Program Status and Fast Facts,' 1 June 2020, and Lockheed Martin, 'Building the F-35: Combining Teamwork and Technology,' accessed 14 June 2020 <https://www.f35.com/about/life-cycle/production>
23. Defence Equipment and Support, 'F-35,' Ministry of Defence, accessed 14 June 2020 <https://des.mod.uk/what-we-do/raf-procurement-support/f-35-lightning-2/>
24. Lockheed Martin, 'Titanium parts for joint strike fighters to be made by BAE Systems in Adelaide,' *Australian Broadcasting Corporation*, 4 December 2013 <https://www.f35.com/news/detail/titanium-parts-for-joint-strike-fighters-to-be-made-by-bae-systems-in-adelaide>
25. Lockheed Martin, 'F-35 Lightning II,' accessed 14 June 2020
26. Valerie Grasso, 'Rare earth elements in national defense: Background, oversight issues, and options for Congress,' *Congressional Research Service*, 23 December 2013, p.4
27. Lorincz, 2014. 'Demilitarization for deep decarbonisation,' *International Peace Bureau*, Draft Working Paper, p.21
28. Curtis, 'The UK will spend over £350bn on extravagant military projects while failing to ensure national health security,' *Declassified UK*, 25 March 2020 <https://www.dailymaverick.co.za/article/2020-03-25-the-uk-will-spend-over-350bn-on-extravagant-military-projects-while-failing-to-ensure-national-health-security/>
29. Ministry of Defence, 'New industry leaders partner with Team Tempest to deliver next generation combat aircraft,' 20 July 2020 <https://www.gov.uk/government/news/new-industry-leaders-partner-with-team-tempest-to-deliver-next-generation-combat-aircraft>
30. Kim Sengupta, 'British army says it must get green to protect environment and maintain recruitment,' *The Independent*, 12 September 2019 <https://www.independent.co.uk/news/uk/home-news/dsei-british-army-green-environment-climate-change-mark-carleton-smith-a9103096.html>
31. Seth Frantzman, 'Lithium-ion battery passes rigorous tests in Israel,' *DefenseNews*, 5 September 2019 <https://www.defensenews.com/industry/techwatch/2019/09/05/lithium-ion-battery-passes-rigorous-tests-in-israel/>
32. The Engineer, 'EADS aircraft runs on algae biofuel,' 21 July 2010 <https://www.theengineer.co.uk/eads-aircraft-runs-on-algae-biofuel/>

33. George Allison, 'Collaboration between BAE and Prismatic delivers two unmanned aircraft prototypes,' *UK Defence Journal*, 10 September 2019 <https://ukdefencejournal.org.uk/collaboration-between-bae-and-prismatic-delivers-two-unmanned-aircraft-prototypes/>
34. George Allison, 'Defence firm Leonardo investing in solar-powered drone with heavy payload,' *UK Defence Journal*, 12 November 2019 <https://ukdefencejournal.org.uk/defence-firm-leonardo-investing-in-solar-powered-drone-with-heavy-payload/>
35. Drone Wars UK, 'British drones: An overview,' May 2019 <https://dronewars.net/british-drones-an-overview/>
36. Neil Trenaman and Murray Gero, 'The next generation in persistent hybrid-powered unmanned surface and subsurface vessels,' *OceanNews*, March 2018 <https://www.oceanaero.com/wp-content/uploads/2018/09/Ocean-Aero-Security-and-Surveillance.pdf>
37. Joe Clarke, 'How weapons manufacturers are preparing for climate change,' *Unearthed Greenpeace*, 26 May 2020 <https://unearthed.greenpeace.org/2020/05/26/climate-change-weapons-manufacturers/>; Ministry of Defence, 'Armoured vehicles to test electric technology,' 20 August 2020 <https://www.gov.uk/government/news/armoured-vehicles-to-test-electric-technology>
38. World Bank, 'Brief: Climate-Smart Mining: Minerals for climate action,' 1 May 2019
39. Ministry of Defence, 'Ministry of Defence Annual Report and Accounts, 2018-19,' p.87
40. David Downs, 'HMS Queen Elizabeth aircraft carrier,' *The Engineer*, 22 May 2014 <https://www.theengineer.co.uk/your-questions-answered-hms-queen-elizabeth-aircraft-carrier/>
41. Aircraft Carrier Alliance, 'Built by the nation, for the nation,' accessed 14 June 2020 <http://www.aircraftcarrieralliance.co.uk/built-by-the-nation-for-the-nation>
42. Royal Navy, 'Queen Elizabeth Class Aircraft Carriers,' accessed 14 June 2020 <https://www.royalnavy.mod.uk/news-and-latest-activity/features/equipped-for-the-future>
43. Royal Navy, 'Tide Class: Fast Fleet Tanker,' accessed 14 June 2020 <https://www.royalnavy.mod.uk/the-equipment/ships/royal-fleet-auxiliary-vessels/tide-class>
44. Naval Technology, 'Type 26 Global Combat Ship (GCS) Programme,' accessed 14 June 2020 <https://www.naval-technology.com/projects/global-combat-ship-gcs-programme/>; and Defense Update, 'BAE selects Plasan to armor Britain's Type 26 Frigates,' 28 February 2018 https://defense-update.com/20180228_type-26_armor.html
45. George Allison, 'The Type 31e Frigate—A guide to the Royal Navy's future warship,' *UK Defence Journal*, 12 September 2019 <https://ukdefencejournal.org.uk/the-type-31e-frigate-a-guide-to-the-royal-navys-future-warship/>
46. Defence Equipment and Support, 'British companies get green light to press ahead with new Army vehicle plans, Defence Minister announces,' *Ministry of Defence*, 19 September 2018 <https://www.gov.uk/government/news/british-companies-get-green-light-to-press-ahead-with-new-army-vehicle-plans-defence-minister-announces>
47. Alex Christian, 'The British Army's new tanks are designed for maximum stealth,' *Wired*, 7 December 2019 <https://www.wired.co.uk/article/british-army-ajax-tank>
48. General Dynamics UK Ltd, 'AJAX: The future of Armoured Fighting Vehicles,' accessed 14 June 2020 <https://generaldynamics.uk.com/systems/land-systems/ajax/>
49. Lorah Steichen and Lindsay Koshgarian 'No warming, no war: How militarism fuels the climate crisis—and vice versa,' *Institute for Policy Studies*, April 2020
50. Ministry of Defence, 'Lt Gen Richard Nugee to lead MOD's climate change policy,' 6 March 2020 <https://www.gov.uk/government/news/lt-gen-richard-nugee-to-lead-mods-climate-change-policy>
51. see Roderick Neumann, 1998. *Imposing Wilderness: Struggles over Livelihood and Nature Preservation in Africa*, University of California Press; and Jake Kosek, 'Purity and pollution: Racial degradation and environmental anxieties,' in Richard Peet and Michael Watts (eds.), 2014. *Liberation Ecologies: Environment, Development, Social Movements*
52. Ministry of Defence, 'Ending wildlife crime: British Army in Africa,' 31 July 2019 <https://medium.com/voices-of-the-armed-forces/ending-wildlife-crime-british-army-in-africa-f633ac4a499c>
53. Ministry of Defence, and Department for Environment, Food and Rural Affairs, 'Counter-poaching troops help with historic Black Rhino move in Malawi,' 26 December 2019 <https://www.gov.uk/government/news/counter-poaching-troops-help-with-historic-black-rhino-move-in-malawi>
54. Ministry of Defence, 'British Forces support Gabon's fight against elephant poachers,' 28 April 2018 <https://www.gov.uk/government/news/british-forces-support-gabons-fight-against-elephant-poachers>
55. Ministry of Defence, 'Ending wildlife crime: British Army in Africa,' 31 July 2019 <https://medium.com/voices-of-the-armed-forces/ending-wildlife-crime-british-army-in-africa-f633ac4a499c>
56. MBDA Missile Systems, 'Team Complex Weapons,' accessed 14 June 2020 <https://www.mbda-systems.com/about-us/mission-strategy/team-complex-weapons/>
57. The Engineer, 'UK Dragonfire consortium to develop high energy laser weapon,' 21 September 2016 <https://www.theengineer.co.uk/uk-dragonfire-consortium-to-develop-high-energy-laser-weapon/>
58. Parkinson, 'The Environmental Impacts of the UK Military Sector,' *Scientists for Global Responsibility and Declassified UK*, May 2020, p.17
59. Army Technology, 'Brimstone advanced anti-armour missile,' accessed 14 June 2020 <https://www.army-technology.com/projects/brimstone/>
60. Oxfam International, 'Press release: Ammunition trade tops \$4 billion yet little regulation to control and keep track of who bullets are sold to,' 30 May 2012 <https://www.oxfam.org/en/press-releases/ammunition-trade-tops-4-billion-yet-little-regulation-control-and-keep-track-who>
61. BAE Systems, 'Products: Small arms ammunition,' accessed 14 June 2020 <https://www.baesystems.com/en-uk/product/small-arms-ammunition>
62. International Lead and Zinc Study Group, 'End uses of lead,' accessed 14 June 2020
63. James Marks, 'Domestic mining of antimony is key to US defense and its economy,' *The Washington Times*, 2 March 2020 <https://www.washingtontimes.com/news/2020/mar/2/domestic-mining-of-antimony-is-key-to-us-defense-a/>
64. <http://tri-starresources.com/>, accessed 14 June 2020
65. Kapadia, 2019. *Insurgent Aesthetics*, Duke University Press, p.49
66. Peter Burt, 'Off the Leash: The development of autonomous military drones in the UK,' *Drone Wars UK*, November 2018
67. see Kapadia, 2019. *Insurgent Aesthetics*, Duke University Press; and Reprieve, 'Drones and Assassinations,' and the Bureau of Investigative Journalism, 'Drone Warfare,' accessed 14 June 2020
68. Amnesty International, 'Deadly Assistance: the role of European states in US drone strikes,' April 2018, p.49
69. Drone Wars UK, 'British drones: an overview,' May 2019 <https://dronewars.net/british-drones-an-overview/>
70. Jack Richardson, 'Eyes in the sky, but at what cost?' *Defence Procurement International*, 20 December 2017 <https://www.defenceprocurementinternational.com/features/air/the-royal-air-forces-reaper-squadron>
71. Dominic Nicholls, 'RAF's new drone to battle terrorists: killing machine which can be entirely operated from the

- UK,' *The Telegraph*, 21 August 2019 <https://www.telegraph.co.uk/news/2019/08/21/rafs-new-drone-battle-against-terrorists-automated-killing-machine/>
72. see Mark Akkerman, 'The business of building walls,' *Transnational Institute*, 5 November 2019
 73. Owen Bowcott, 'GCHQ data collection regime violated human rights, court rules,' *The Guardian*, 13 September 2018 <https://www.theguardian.com/uk-news/2018/sep/13/gchq-data-collection-violated-human-rights-strasbourg-court-rules>
 74. Richard Norton-Taylor, 'The Doughnut, the less secretive weapon in the fight against international terrorism,' *The Guardian*, 10 June 2003 <https://www.theguardian.com/uk/2003/jun/10/terrorism.Whitehall>
 75. James Wright, 'What materials are used to make computers?' *Techwalla*, accessed 14 June 2020 <https://www.techwalla.com/articles/what-materials-are-used-to-make-computers>
 76. IBM, 'The UK Ministry of Defence uses IBM technology to create smarter, greener buildings,' 28 November 2012
 77. Oscar Williams, 'Peter Thiel's Palantir has quietly secured £39 million of UK government deals,' *New Statesmen*, 3 December 2019 <https://tech.newstatesman.com/cloud/peter-thiel-palantir-mod-contracts-2>
 78. Spencer Woodman, 'Palantir provides the engine for Donald Trump's deportation machine,' *The Intercept*, 2 March 2017 <https://theintercept.com/2017/03/02/palantir-provides-the-engine-for-donald-trumps-deportation-machine/>
 79. Edward Qualtrough, 'Ministry of Defence CIO Charles Forte interview – Digitising warfare in the information age,' CIO, 16 December 2019 <https://www.cio.co.uk/cio-interviews/mod-cio-charles-forte-interview-digitising-warfare-3780274/>
 80. Ministry of Defence, 'Cyber innovation at the forefront of UK's approach to modern warfare,' 22 May 2019 <https://www.gov.uk/government/news/cyber-innovation-at-the-forefront-of-uks-approach-to-modern-warfare>
 81. Matt Kennard and Mark Curtis, 'Revealed: How Britain's profiteering spymasters ignored the country's biggest threats like coronavirus—and endangered the public,' *Declassified UK*, 7 May 2020 <https://www.dailymaverick.co.za/article/2020-05-07-revealed-how-britains-profiteering-spymasters-ignored-the-countrys-biggest-threats-like-coronavirus-and-endangered-the-public/>
 82. Ministry of Defence, 'Cyber innovation at the forefront of UK's approach to modern warfare,' 22 May 2019
 83. Ben Quinn, 'Revealed: the MoD's secret cyberwarfare programme,' *The Guardian*, 16 March 2014 <https://www.theguardian.com/uk-news/2014/mar/16/mod-secret-cyberwarfare-programme>
 84. George Allison, 'What does the secretive 77th Brigade do?' *UK Defence Journal*, 21 June 2016 <https://ukdefencejournal.org.uk/secretive-77th-brigade/>
 85. Glenn Greenwald, 'How covert agents infiltrate the internet to manipulate, deceive and destroy reputations,' *The Intercept*, 24 February 2014 <https://theintercept.com/2014/02/24/jtrig-manipulation>
 86. Gómez-Barris, 2017. *The Extractive Zone*, p.7
 87. Airbus, 'Airbus' golden jubilee for Skynet secure satellite communications,' 22 November 2019 <https://www.airbus.com/newsroom/press-releases/en/2019/11/airbus-golden-jubilee-for-skynet-secure-satellite-communications.html>
 88. George Allison, 'SKYNET 6 British military satellite project receives boost,' *UK Defence Journal*, 13 September 2019 <https://ukdefencejournal.org.uk/skynet-6-british-military-satellite-project-receives-boost/>; and Conor Reynolds, 'Who wants to run SKYNET 6? Government says £6 billion in contracts is landing soon,' *Computer Business Review*, 12 September 2019 <https://www.cbronline.com/news/skynet-contract>
 89. Ministry of Defence, 'UK Defence in numbers 2019,' p.14
 90. Ministry of Defence, 'RAF pilot seconded to Virgin Orbit space programme,' 3 October 2019 <https://www.gov.uk/government/news/raf-pilot-seconded-to-virgin-orbit-space-programme>
 91. Royal Air Force, 'Royal Air Force Strategy: Delivering a world-class air force,' accessed 14 June 2020
 92. Ministry of Defence, 'RAF pilot seconded to Virgin Orbit space programme,' 3 October 2019 <https://www.gov.uk/government/news/raf-pilot-seconded-to-virgin-orbit-space-programme>
 93. includes Australia, Canada, New Zealand, and the US
 94. Ministry of Defence, 'Defence leaders to join forces at 2020 Space Conference,' 9 January 2020 <https://www.gov.uk/government/news/defence-leaders-to-join-forces->

EXTRACTIVE WARFARE

1. Ministry of Defence, 'Annual Report and Accounts 2018-19,' p.23
2. Mark Curtis and Matt Kennard, 'Britain's seven covert wars: An explainer,' *Declassified UK*, 17 September 2019 <https://www.dailymaverick.co.za/article/2020-02-07-explainer-is-the-uk-a-rogue-state-17-british-policies-violating-domestic-or-international-law/>
3. Gary Machlis and Thor Hanson, 2008. 'Warfare Ecology,' *BioScience*, 58(8), p.729-736; Aneaka Kellay, 'Pollution politics: Power, accountability and toxic remnants of war,' *Toxic Remnants of War*, 2014
4. Conflict and Environment Observatory, 'The United Kingdom's practice on the protection of the environment in relation to armed conflicts,' October 2019
5. Richard Zentelis and David Lindenmayer, 2014. 'Bombing for biodiversity—enhancing conservation values of military training areas,' *Conservation Letters*
6. see Daniel Immerwahr, 2019. *How to Hide an Empire: A history of the Greater United States*. Farrar, Straus and Giroux
7. Phil Miller, 'UK could double supply of medical ventilators with money spent on foreign military bases,' *Declassified UK*, 19 March 2020 <https://www.dailymaverick.co.za/article/2020-03-19-uk-healthcare-suffers-while-country-spends-141m-on-overseas-military-bases/>; and 'List of British Army installations,' Wikipedia, accessed 19 June 2020 https://en.wikipedia.org/wiki/List_of_British_Army_installations
8. The Independent, 'UK "could build new military bases around world after Brexit",' 30 December 2018 <https://www.independent.co.uk/news/uk/politics/brexit-uk-military-bases-caribbean-far-east-eu-global-player-a8703816.html>
9. Majeed, 2004. 'The impact of militarism on the environment,' *Physicians for Global Survival*
10. UK Defence & Security Organisation, 'UK Defence & Security Export Statistics for 2018,' *Department for International Trade*, 30 July 2019, p.5
11. Jamie Doward, 'Britain boosts arms sales to repressive regimes by £1bn,' *The Guardian*, 25 April 2020 <https://www.theguardian.com/world/2020/apr/25/uk-arms-trade-repressive-regimes>
12. Arj Singh, 'Sandhurst earns millions training cadets from nations with 'terrible' human rights records,' 19 June 2020, *Huffington Post* https://www.huffingtonpost.co.uk/entry/sandhurst-training-human-rights-military_uk_5eeeb6e0c5b6c1f6518b4040
13. Tax Justice Network, 'Corporate Tax Haven Index 2019,' accessed 14 June 2020 <https://www.corporatetaxhavenindex.org/>
14. Joe Roeber, 'Hard-wired for corruption: the arms trade and corruption,' *Prospect*, 28 August 2005
15. Ministry of Defence, 'Joint Doctrine Note 1/15: Defence Engagement,' August 2015, p.20
16. United Nations Environment Programme, 'Greening the Blue Helmets,' May 2012, p.5

17. United Nations Environment Programme, 'Greening the Blue Helmets,' May 2012, p.4
18. see André Mesquita, 'Counter-cartographies: Politics, art and the insurrection of maps,' in *kollektiv orangotango+* (ed.) This is Not an Atlas, 2018, p.26–30
19. Ministry of Defence, 'National Security through Technology: Technology, Equipment, and Support for UK Defence and Security,' February 2012, p.49
20. Tristan Hopper, 'Alberta's British invasion: Massive military base allows troops from UK to replicate war,' *National Post*, 25 May 2017 <https://nationalpost.com/news/canada/albertas-british-invasion-massive-military-base-allows-troops-from-u-k-to-replicate-war>
21. The British Army, 'Deployments: Canada,' accessed 14 June 2020 <https://www.army.mod.uk/deployments/canada/>
22. BP Canada, 'Oil sands,' accessed 14 June 2020 https://www.bp.com/en_ca/canada/home/who-we-are/oil-sands.html
23. Indigenous Environmental Network, 'Canadian tar sands resistance,' accessed 14 June 2020 <https://www.ienearth.org/what-we-do/tar-sands/>; and Jennifer Huseman, 'Tar sands and the Indigenous Peoples of Northern Alberta,' in Damien Short, 2016. *Redefining Genocide: Settler Colonialism, Social Death and Ecocide*.
24. Phil Miller and Matt Kennard, 'Britain uses vast swathes of one of the world's most biodiverse countries for military training—and pays nothing,' *Declassified UK*, 4 February 2020 <https://www.dailymaverick.co.za/article/2020-02-04-exclusive-britain-uses-vast-swathes-of-one-of-the-worlds-most-biodiverse-countries-for-military-training-and-pays-nothing/>
25. Foreign Affairs Committee, 'Libya: Examination of intervention and collapse and the UK's future policy options – Third report of session 2016–17,' House of Commons, 6 September 2016
26. Emma Graham-Harrison, 'Migrants from west Africa being 'sold in Libyan slave markets,' *The Guardian*, 10 April 2017 <https://www.theguardian.com/world/2017/apr/10/libya-public-slave-auctions-un-migration>
27. Julia Payne and Ahmad Ghaddar, 'Trading giant Glencore extends major Libyan oil deal,' *Reuters*, 6 February 2017 <https://www.reuters.com/article/us-glencore-libya-oil-idUSKBN15LQJM>
28. Ministry of Defence, 'UK extends commitment to fight violent extremism in the Sahel,' 12 June 2020 <https://www.gov.uk/government/news/uk-extends-commitment-to-fight-violent-extremism-in-the-sahel>; 'UK Troops reach training milestone ahead of UN Peacekeeping deployment to Mali,' 29 July 2020 <https://www.gov.uk/government/news/uk-troops-reach-training-milestone-ahead-of-un-peacekeeping-deployment-to-mali>
29. Rosie Laydon, 'British troops in West Africa: Training local forces to fight terror,' *Forces Net*, 9 March 2020 <https://www.forces.net/news/british-troops-west-africa-training-local-forces-fight-terror>
30. Nick Turse, 'Pentagon's own map of US bases in Africa contradicts its claim of 'light' footprint,' *The Intercept*, 27 February 2020 <https://theintercept.com/2020/02/27/africa-us-military-bases-aficom/>
31. Agence France-Presse, 'Mali to investigate after army accused of killing dozens in village attack,' 6 June 2020 <https://www.theguardian.com/world/2020/jun/06/mali-to-investigate-after-army-accused-of-killing-dozens-in-village-attack>
32. Kodal Minerals, accessed 14 June 2020 <https://kodalminerals.com>
33. Human Rights Watch, 'Egypt,' accessed 14 June 2020 <https://www.hrw.org/middle-east/n-africa/egypt>
34. Ministry of Defence, 'Annual Report and Accounts 2018–19,' p.35
35. Campaign Against Arms Trade, 'UK Arms Export Licenses: Egypt since 2013,' accessed 15 June 2020
37. Centamin, 'About us: Board of directors,' accessed 14 June 2020 <https://www.centamin.com/about-us/our-team/the-board>
38. Ministry of Defence, 'Annual Report and Accounts 2018–19,' p.50
39. Joshua Rozenberg, 'MOD pays £4.5m to victims of Kenyan exercises,' *The Telegraph*, 20 July 2002 <https://www.telegraph.co.uk/news/worldnews/africaandindianocean/kenya/1401968/MoD-pays-4.5m-to-victims-of-Kenyan-exercises.html>
40. Damian Carrington, 'Hypocrisy: 90% of UK-Africa summit's energy deals were in fossil fuels,' *The Guardian*, 24 January 2020 <https://www.theguardian.com/environment/2020/jan/24/90-pe-cent-uk-africa-energy-deals-fossil-fuel>
41. Base Resources, accessed 14 June 2020 <https://baseresources.com.au/>
42. Goldplat, accessed 14 June 2020 <http://www.goldplat.com/>
43. Red Rock Resources, 'Projects and Investments: Gold,' accessed 14 June 2020 <https://www.rrrplc.com/projects-and-investments/gold/>
44. Shanta Gold, 'Full year 2019: Presentation audited results,' 28 February 2020
45. Ministry of Defence, 'Annual Report and Accounts 2018–19,' p.29
46. Ross Caputi, 'The victims of Fallajuh's health crisis are stifled by western silence,' *The Guardian*, 25 October 2012 <https://www.theguardian.com/commentisfree/2012/oct/25/fallujah-iraq-health-crisis-silence>
47. Medea Benjamin and Nicolas Davies, 'The Iraq death toll 15 years after the US invasion,' *Common Dreams*, 15 March 2018 <https://www.commondreams.org/views/2018/03/15/iraq-death-toll-15-years-after-us-invasion>
48. Paul Bignell, 'Secret memos expose link between oil firms and invasion of Iraq,' *The Independent*, 19 April 2011 <https://www.independent.co.uk/news/uk/politics/secret-memos-expose-link-between-oil-firms-and-invasion-of-iraq-2269610.html>
49. Campaign Against Arms Trade, 'UK Arms Export Licenses: Israel since 2010,' accessed 14 June 2020
50. Wikipedia, 'WK450 Thales Watchkeeper,' accessed 14 June 2020 https://en.wikipedia.org/wiki/Thales_Watchkeeper_WK450
51. Anshel Pfeffer, 'UK commanders join Israel's largest-ever naval exercise,' *The Jewish Chronicle*, 16 August 2019 <https://www.thejc.com/news/uk-news/uk-commanders-join-israel-s-largest-ever-naval-exercise-1.487562>
52. Corporate Watch, 'Energean: Israel-backed Greek oil company hungry for Mediterranean gas,' 19 September 2019 <https://corporatewatch.org/energean-israeli-backed-greek-oil-company-hungry-for-mediterranean-gas/>
53. BBC News 'Business: Company File Arms sales fuel BAE's profits,' 25 February 1999 <http://news.bbc.co.uk/1/hi/business/285963.stm>
54. Kate Hodal, 'Yemen heads list of countries facing worst humanitarian disasters in 2020,' *The Guardian*, 7 January 2020 <https://www.theguardian.com/global-development/2020/jan/07/yemen-heads-list-of-countries-facing-worst-humanitarian-disasters-in-2020>
55. War in Yemen, made in Europe,' accessed 14 June 2020 <https://yemen.vredesactie.be/index.html>
56. Alan Tovey, 'BAE Systems agrees long-awaited Saudi order of 48 Typhoon jets,' *The Telegraph*, 9 March 2018 <https://www.telegraph.co.uk/business/2018/03/09/bae-systems-poised-unveil-long-awaited-saudi-order-48-typhoon/>

57. Mike Lewis and Katherine Templar, 'UK personnel supporting the Saudi Armed Forces—Risk, knowledge and accountability,' 2018; and 'Saudi Arabia: Military Aircraft: Written question – 149016,' 11 June 2018 <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-question/Commons/2018-06-01/149016/>
58. Phil Miller, 'Revealed: Hundreds of Saudi and Gulf military personnel trained in Britain as Yemen war continues,' *Declassified UK*, 3 July 2020 <https://www.dailymaverick.co.za/article/2020-07-03-revealed-hundreds-of-saudi-and-gulf-military-personnel-trained-in-britain-as-yemen-war-continues/>
59. Royal Air Force, 'No 83 Expeditionary Air Group,' accessed 14 June 2020 <https://www.raf.mod.uk/our-organisation/groups/no-83-expeditionary-air-group/>
60. Fergus Kelly, 'Qatar signs £6 billion deal with UK for 24 Typhoon fighter jets, missiles and bombs,' *The Defense Post*, 10 December 2017 <https://www.thedefensepost.com/2017/12/10/qatar-typhoon-fighter-missiles-bombs-deal-uk/>
61. Phil Miller, 'Revealed: Hundreds of Saudi and Gulf military personnel trained in Britain as Yemen war continues,' *Declassified UK*, 3 July 2020 <https://www.dailymaverick.co.za/article/2020-07-03-revealed-hundreds-of-saudi-and-gulf-military-personnel-trained-in-britain-as-yemen-war-continues/>
62. Shell, 'Qatargas 4,' accessed 14 June 2020 https://www.shell.com.qa/en_qa/about-us/projects-and-sites/qatargas-four.html
63. Glencore Plc, accessed 14 June 2020 <https://www.marketscreener.com/GLENCORE-PLC-8017494/company/>
64. Ministry of Defence, 'Annual Report and Accounts 2018-19,' p.17
65. Duncan Campbell, 'GCHQ's beyond top secret Middle Eastern internet spy base,' *The Register*, 3 June 2014
66. Ministry of Defence, 'A visual guide to Exercise Saif Sareea logistics,' 21 September 2018 <https://www.gov.uk/government/news/a-visual-guide-to-exercise-saif-sareea-logistics>
67. Phil Miller, 'Revealed: how the British military supplies 'mercenary' forces to a Gulf dictatorship,' *Declassified UK*, 20 July 2020 www.dailymaverick.co.za/article/2020-07-20-revealed-how-the-british-military-supplies-mercenary-forces-to-a-gulf-dictatorship/
68. BAE Systems, 'Sultanate of Oman,' accessed 14 June 2020 <https://www.baesystems.com/en/product/sultanate-of-oman>
69. Dominic Dudley, 'Which country spends most per person on defense? It might not be the one you think,' *Forbes*, 19 February 2020 <https://www.forbes.com/sites/dominicdudley/2020/02/19/country-spends-most-on-defense/#1772bc5712f8>
70. BP 'BP to develop second phase of Oman's giant Khazzan gas field,' 9 April 2018 <https://www.bp.com/en/global/corporate/news-and-insights/press-releases/bp-to-develop-second-phase-of-omans-giant-khazzan-gas-field.html>
71. Petroleum Development Oman, accessed 14 June 2020 https://www.shell.com.om/en_om/about-us/what-we-do/qalhat-Ing-saoc.html
72. Jon Yeomans, 'Uranium miner Berkeley Energia wins £93m backing from Oman,' *The Telegraph*, 30 August 2017 <https://www.telegraph.co.uk/business/2017/08/30/uranium-miner-berkeley-energia-wins-93m-backing-oman/>
73. The National Archives, 'FCO 15/2676: Gurkhas in Singapore 1980 January 01 – 1980 December 31,' record opening date 15 March 2011 <http://discovery.nationalarchives.gov.uk/details/r/C11605130>
74. The British Army, 'Deployments: Brunei,' accessed 14 June 2020 <https://www.army.mod.uk/deployments/brunei/>
75. Brunei Shell Petroleum, 'Overview of our Business,' accessed 14 June 2020 <https://www.bsp.com.bn/main/about-bsp/overview-of-our-business>

REVOLVING DOORS

1. Ministry of Defence, 'Our governance,' accessed 14 June 2020 <https://www.gov.uk/government/organisations/ministry-of-defence/about/our-governance>
2. Defence Equipment & Support, 'Annual Report and Accounts 2018-19,' Ministry of Defence, p.39
3. Ministry of Defence, 'Charles Forte appointed new MOD Chief Information Officer,' 9 January 2018 <https://www.gov.uk/government/news/charles-forte-appointed-new-mod-chief-information-officer>
4. Kennard and Curtis, 'How Britain's profiteering spymasters ignored the country's biggest threats like coronavirus—and endangered the public,' *Declassified UK*, 7 May 2020 <https://www.dailymaverick.co.za/article/2020-05-07-revealed-how-britains-profiteering-spymasters-ignored-the-countrys-biggest-threats-like-coronavirus-and-endangered-the-public/>
5. Register of Lords' Interests, accessed 14 June 2020 <https://www.parliament.uk/mps-lords-and-offices/standards-and-financial-interests/house-of-lords-commissioner-for-standards-/register-of-lords-interests/>
6. Yellow Cake, 'Leadership,' accessed 14 June 2020 <https://www.yellowcakeplc.com/about/leadership/>
7. see <https://markets.ft.com/data/>
8. Corporate Watch, 'Wreckers of the Earth: London company directory,' accessed 14 June 2020 <https://corporatewatch.org/wreckers-of-the-earth-london-company-directory/>

OPENINGS

1. see The Red Nation, 'The Red Nation Manifesto: Ten Point Program,' <https://therednation.org/10-point-program/>; Movement for Black Lives, 'Vision for Black Lives: 2020 Policy Platform,' <https://m4bl.org/policy-platforms/>; BDS Movement, <https://bdsmovement.net/>; Wretched of the Earth, 'Our house has been on fire for over 500 years,' 20 September 2019 <https://medium.com/@wretchedofearth/our-house-has-been-on-fire-for-over-500-years-79de7d11f810>; La Via Campesina, <https://viacampesina.org/en/>; Abahlali base Mjondolo, <http://abahlali.org/>; Indigenous Environmental Network, <https://www.ienearth.org>



Martial Mining: resisting extractivism and war together