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Risk at the Source:

Critical Mineral Supply Chains and State-Imposed Forced Labour in the Uyghur Region

Global Rights Compliance

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Design by Southpaw Creative.

About Global Rights Compliance

Global Rights Compliance, founded in 2013, is an international human rights law and development foundation headquartered in The Hague. Its core purpose is to achieve justice through the innovative application of international law.

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Executive Summary

Crimes against humanity continue unabated and forced labour grows unchecked in the Xinjiang Uyghur Autonomous Region (XUAR or the Uyghur Region). The PRC has now invested significant resources to expand critical mineral exploration, mining, processing, and manufacturing in the XUAR. The region's rich mineral reserves and geographic proximity to China's trading partners have established it as a national extractive hub.

This represents a critical risk for governments, manufacturers, and consumers, and affects supply chains ranging from electronics and kitchenware to aerospace, energy, and defence.

The demand for critical minerals is rising sharply, driven by the global transition to clean energy and the advancement of modern technology. Governments are determining which minerals are critical to their national security and assessing their access to those crucial resources. Manufacturers around the world are competing to secure a stable supply of the minerals necessary for production. Securing these supply chains is an urgent matter of enormous international significance.

The People's Republic of China (PRC) dominates the critical minerals sector in the international race to secure resources. The PRC is a vital "chokepoint" in critical mineral supply chains, controlling at least one stage of many key mineral value chains. According to 2024 United States government statistics, the PRC was the leading producer of 30 of 44 minerals the U.S. designates as critical.

The PRC's increasing investments in mineral exploration in the Uyghur Region have yielded significant results. As of July 2024, 153 types of minerals had been identified in the Region, accounting for 88% of the types found in China. One hundred and three of those have proven reserves. Among the proven resource reserves, 77 rank among the ten most significant reserves in the country.

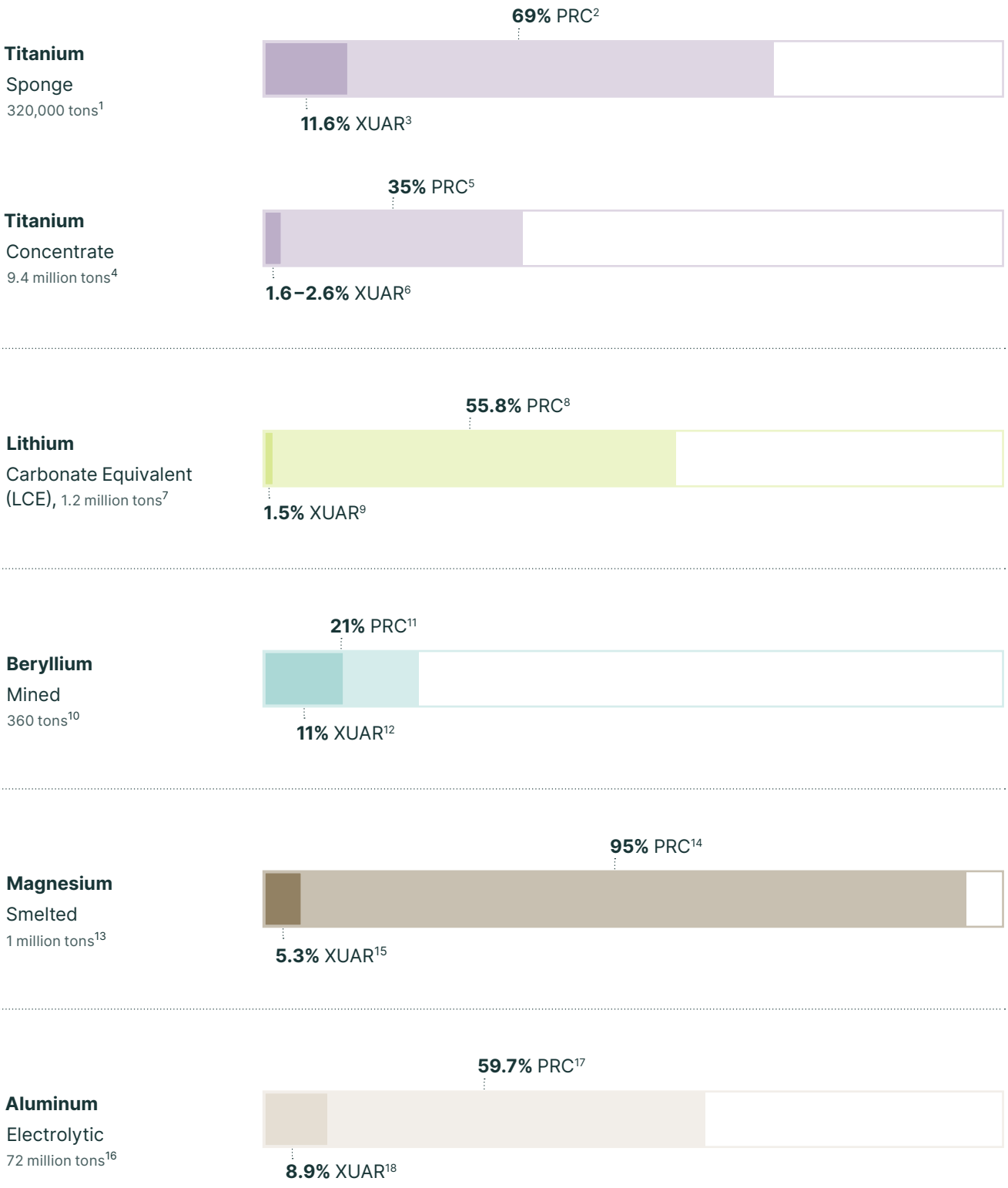
The PRC government has defied international outrage over human rights abuses in the XUAR and invested significantly in expanding critical minerals exploration, mining, processing, and manufacturing in the region over the last decade. Mineral mining and processing in the XUAR rely in part on the state's forced labour programs for Uyghurs and other Turkic people in the region. Experts recognize that the XUAR's systemic forced labour practices are not only a means to subsidise operating costs but also facilitate the government's persecution of the Uyghur population through familial separation, land expropriation, and forced re-education.

The use of coal as the main energy source, the lack of labour and environmental standards, and the deployment of opaque distribution centres together serve to artificially deflate the cost of goods made in the Uyghur Region and create an unfair playing field for legitimate businesses. The Uyghur Region's abundance of coal and lack of environmental regulations also drive its evolution into the epicentre of the energy-intensive mineral mining and processing industry. Minerals mined and/or refined in the region routinely enter global supply chains through unregulated or opaque mineral distribution channels. As a result, significant portions of the world's economy are potentially exposed to products tainted by forced labour and high carbon footprints.

This research analyses corporate annual reports and marketing, state media, and shipping records to spotlight four critical minerals with a significant presence in the XUAR and substantial influence on global supply chains: titanium, lithium, beryllium, and magnesium.

- Global Rights Compliance found that for each of the four minerals studied, **major mining and processing companies are participating in the state labour transfer programs**, which scholars and legal experts identify as forced labour.
- The report identifies **77** critical minerals sector companies and downstream manufacturers of minerals-based products **operating in the XUAR**, and therefore are at risk of participating in labour transfer programs, in the titanium, lithium, beryllium, and magnesium industries.
- Research found **15 companies with documented sourcing directly from those XUAR-based companies in the last two years**.
- The report uncovers **68 downstream customers of those Chinese suppliers with sourcing from the Uyghur Region**, indicating a risk that inputs may have been sourced from the region.
- **Research identified 18 XUAR entity parent companies** that may source inputs from their XUAR subsidiaries.

Mineral Snapshots, Worldwide Production



* These figures are estimates based on best available data at the time of publication, featuring the minerals and products that are most relevant to XUAR production.

Mineral Snapshots

Ti TITANIUM

- Titanium is a critical input in automotive, aerospace, and medical applications.
- The PRC is the world's leading producer and consumer of titanium products.
- The Uyghur Region is a significant producer of **titanium sponge**, the critical input for titanium metal production. In total, the region accounts for **approximately 17% of China's titanium sponge production and more than 11% of global production**. The region also makes titanium dioxide, which is used in paints.
- Titanium processing in the Uyghur Region is largely controlled by **Hunan Wujo Light Chemical Group subsidiaries, including Xinjiang Xiangrun New Materials Technology Co., Ltd. (aka XRUN). CNNC Hua Yuan Titanium Dioxide Co., Ltd. (aka CHTi)** also owns subsidiaries in the region.
- Titanium from the Uyghur Region is used in the ingots, bars, plates, and pipes that are crucial to the aerospace, automotive, and other industries. In addition, the titanium processed in the region enters the supply chains for many of the **world's biggest home and commercial paint companies**. One of the companies profiled in the chapter has a production base in the XUAR and produces the **increasingly popular insulated mugs, flasks, and cups** made of titanium and other materials that are sold internationally.

Li LITHIUM

- Lithium is an essential component in green technologies, particularly electric vehicles, energy storage systems, and electronic devices.
- The PRC is the world's leading processor of lithium, currently accounting for nearly 56% of global lithium production (lithium carbonate equivalent). It is also increasingly a key player in lithium mining.
- Lithium exploration, mining, processing, and especially downstream battery production are increasing rapidly in the XUAR, as part of the PRC's domestic resource development.
- All active lithium mining and processing in the Uyghur Region in 2024 was conducted by **Xinjiang Zhicun New Energy Materials Co., Ltd.** (which opened at least 17 new subsidiaries in the region totalling a $2.9 billion investment since 2022), **Xinjiang Nonferrous Metal Industry (Group) Co., Ltd.** (a major state-owned mining conglomerate that is on the U.S. Uyghur Forced Labor Prevention Act Entities List), and **SDIC Xinjiang Lithium Co, Ltd.**
- While lithium mining and processing projects are just beginning to take off in the Uyghur Region, major lithium-based product manufacturers have a firmly established presence. For instance, XUAR-based manufacturers have produced hundreds of millions of **lithium-based batteries for consumer and industrial use**, including for smartphones, tablets, power tools, energy storage, automobiles, wind turbines, and servomotors.

Be BERYLLIUM

- Beryllium is vital to the aerospace, defence, telecommunications, and electronics industries.
- The PRC accounts for approximately 22% of global beryllium mine production.
- Approximately **83.5% of China's beryllium reserves are in the XUAR and the Region is the top source of beryllium in the country,** accounting for over **50% of domestic supply.**
- State-owned and U.S.-sanctioned mining conglomerate **Xinjiang Nonferrous Metal Industry (Group) Co., Ltd.** controls the extraction, production, and processing of beryllium in the Uyghur Region through its subsidiary, **Fuyun Hengsheng Beryllium Industry Co., Ltd.**
- The beryllium mined in the Uyghur Region appears to be used for the manufacture of specialty **explosion-proof tools** and for nuclear-grade beryllium fluoride used in a **non-uranium-based class of nuclear fission reactor** that is important to China's nuclear innovation program and may be used in Chinese container ships.

Mg MAGNESIUM

- Magnesium is primarily used in lightweight metal alloys for industrial and commercial purposes.
- The PRC produces 92% of the world's raw magnesium. The XUAR is one of only five province-level jurisdictions that produces raw magnesium.
- The XUAR accounted for **5.6% of China's smelted magnesium production** in 2024, but output is expected to double in 2025.
- Several major magnesium suppliers operate in the Uyghur Region, including **Xinjiang Jinsheng Magnesium Co., Ltd., Rare Earth Magnesium Technology (REMT) Group Holdings Ltd.,** and **Xinjiang Banchao Group Co., Ltd.**
- China's largest aluminium companies purchase magnesium products made by these Uyghur Region companies, likely for the production of **aluminium alloys**. This potentially affects a wide range of industrial and consumer goods, including in the automotive, aerospace, and electronics industries.

All companies identified in this report were given the opportunity to respond. Their responses can be found in the Corporate Responses Annex on the webpage for this report.

Recommendations

RECOMMENDATIONS TO GOVERNMENTS

- Pass and enforce legislation to prohibit the importation of goods made, in whole or in part, with forced labour, which includes a rebuttable presumption mechanism that can be applied to entire regions or industries where it can be presumed that goods are made with state-imposed forced labour.

- Pass mandatory human rights and environmental due diligence laws as a necessary complement to import bans. Governments should implement human rights due diligence laws with specific mechanisms for identifying and mitigating exposure to state-imposed forced labour across the full supply chain, in alignment with the UN Guiding Principles on Business and Human Rights and the OECD Due Diligence Guidance for Responsible Business Conduct. Risk and impact identification, monitoring, and mitigation reporting should be accessible to the public.

- Ensure bilateral and multilateral engagements on critical mineral security directly address exposure to and avoidance of state-imposed forced labour throughout the minerals supply chain. Partnerships and agreements arising from international collaboration should incorporate binding and enforceable labour, environmental, and human rights standards.

- Exclude products made in whole or in part with state-imposed forced labour, including those in the XUAR, from all government procurement.

- Require companies to publish a list of their critical raw materials suppliers and processors/refiners and document the GPS coordinates where entities at those stages of the supply chain operate.

- The U.S. government should name titanium, lithium, beryllium and magnesium as high-priority sectors under the Uyghur Forced Labor Prevention Act (UFLPA) and should add these products to the Department of Labor's List of Products Made with Child and Forced Labor. The U.S. Forced Labor Enforcement Task Force should swiftly investigate the companies named in this report for consideration for addition to the UFLPA Entity List.

RECOMMENDATIONS TO PRIVATE-SECTOR ENTITIES

- Commit to the call to action of the Coalition to End Forced Labour in the Uyghur Region and extricate their sourcing and full supply chains from the Uyghur Region. Companies must urgently trace their supply chain and address any points of exposure to Uyghur forced labour at every tier of the supply chain. This includes identifying whether any suppliers outside of the Uyghur Region have participated in state labour transfer programs.

- Conduct robust supply chain mapping to identify exposure to the XUAR, disengage from all XUAR-based suppliers, and work with suppliers outside of the XUAR where risk is found to exclude XUAR sourcing. This mapping should extend across the minerals supply chain, from mining to processing and further downstream manufacturing.

- Human rights due diligence should be a high priority at the board level and be integrated into a company's strategic planning and operations. This ensures that human rights considerations are at the forefront of decision-making. Board oversight establishes accountability and ensures sufficient resources are allocated to implement human rights due diligence processes.

- Make public commitments not to conduct, commission, or review social audits in the XUAR. Companies should only rely on social audits where they are unannounced and where workers are able to speak unfettered and without fear of retaliation.

Further recommendations for governments, the private sector, industry associations, certification bodies, and investors can be found in the conclusion.

Introduction

Critical minerals are essential for the components, infrastructure, and advancement of modern economies, technologies, and national security. From cosmetics to construction, cell phones to satellites, power grids to weapons systems—the global economy relies on the stable and sufficient supply of minerals and metals.

The People's Republic of China (PRC) dominates the world's mining, processing, and further manufacturing of critical minerals. According to U.S. government statistics, the PRC was the leading producing country for 30 of 44 critical minerals in 2024.[19] Decades of domestic policy have secured the PRC's strategic position across global critical mineral value chains.[20] Governments and industries aiming to diversify critical mineral supply chains beyond the PRC face significant challenges, including resource access, intensive capital requirements, regulatory and market volatilities, and environmental concerns associated with new mining and processing operations.

The PRC has identified the Xinjiang Uyghur Autonomous Region's (XUAR or the Uyghur Region) natural resources as critical feedstocks for the pursuit of national "self-sufficiency" and industrial development.[21] Simultaneously, the PRC central and XUAR regional governments have instituted repressive policies for ethnic minority populations in the Uyghur Region, amounting to what legal experts and governments have deemed genocide, crimes against humanity, and forced labour.[22] Global reliance on PRC minerals is poised to undermine efforts by governments, investors, manufacturers, and consumers to eliminate Uyghur forced labour from global supply chains. Furthermore, corporate due diligence efforts are increasingly complicated by the opacity of the PRC's critical minerals supply chains.

As this report will reveal, the growth of the extractive industry is driven by the PRC's industrial policy directives shifting labour- and energy-intensive production to the Uyghur Region, where state subsidies and state-imposed labour programs reduce operating costs and ensure the government's pervasive control over local Uyghur and other minoritized residents.

Forced Labour in the Uyghur Region

Increasingly since 2014, Uyghur, Kazakh, Kyrgyz, and other minoritized citizens in the Uyghur Region have remained the focus of PRC state repression and have been subjected to the region's experimental and expansive systems of mass surveillance, internment, imprisonment, and state-imposed forced labour.

Over the past decade, organisations and governments at the international, multilateral, and national levels have recognized the PRC's campaign of repression and forced labour in the Uyghur Region as violative of international and national laws, including prohibitions against forced labour, crimes against humanity, and genocide.[23] A 2022 landmark report from the United Nations details the widespread human rights abuses in the region, including the internment of more than one million Turkic Muslims. The report concludes that "[t]he extent of arbitrary and discriminatory detention of members of Uyghur and other predominantly Muslim groups, pursuant to law and policy, in context of restrictions and deprivation more generally of fundamental rights enjoyed individually and collectively, may constitute international crimes, in particular crimes against humanity."[24] A 2024 report published by the U.S. Holocaust Museum indicates that mass arbitrary detention continues and that there is no evidence to suggest that the hundreds of thousands of people documented to have been sentenced to long terms since 2014 have been released.[25]

Figure 1: Military training for the class of 2023 at Altay Regional Vocational and Technical School, whose graduates have been sent to Hengsheng Beryllium and other mining operations in the XUAR. Credit: Publicity Office, Ideological and Political Science Department, Altay Vocational and Technical School.

COERCIVE CONTEXT: DEFINING STATE-IMPOSED FORCED LABOUR

The majority of global forced labour exploitation occurs in the private economy—i.e., imposed by individuals, groups and corporate actors in the private sector.[26] In contrast, the 2024 ILO handbook defines state-imposed forced labour as "the prohibited exaction of compulsory labour by the State"[27] which operates *"through a pervasively coercive wider social context marked by a general lack of civic freedoms and a state apparatus that generates powerful coercive pressures through an extensive grassroots apparatus consisting of state and non-state institutions. Non-cooperation entails a systemic risk that is often more implicit than overt. Those who fail to comply risk a broad range of ramifications by the state, including loss of income, harassment, violence or detention."*[28] In addition, under conditions of state-imposed forced labour it is impossible for victims to access remediation avenues,[29] essentially reversing the traditional role of the State from protector to perpetrator.[30]

State-imposed forced labour is a key feature of the PRC's systematic repression of Uyghur and other Turkic people in the Region. Government directives and planning documents demonstrate the State's utilization of forced labour as a tool for ethnic and religious repression, political and ideological indoctrination, mass surveillance, and social control.[31] State-imposed forced labour in the Uyghur Region has operated since at least 2017 through internment labour linked to re-education camps and non-internment forced labour imposed through the "Poverty Alleviation through Labour Transfer" program, under which "surplus" rural labourers are transferred into secondary or tertiary sector work.[32] In 2024, the International Labor Organization (ILO) published an updated guideline ("ILO Guidance") identifying circumstances and conduct related to state-imposed forced labour, including an authoritative definition of "state-imposed forced labour."[33] The ILO Guidance explicitly identifies "labour transfers" as an instrument of state-imposed forced labour, "where workers belonging to certain ethnic or religious minority groups must—under menace of penalty—relocate to another geographical area to work in a State or private enterprise, sometimes under guise of vocational training or regional economic development."[34] Adrian Zenz explains that these labour transfers are "essentially only used in PRC contexts" to describe the forced relocation of minoritized citizens, and "therefore points unambiguously to forced labour in Xinjiang."[35] In February 2025, independent experts from the International Trade Unions Confederation (and cited by the ILO) observed the continued use of labour transfers indicative of state-imposed forced labour among the PRC's ongoing abuses in the XUAR.[36] The UN Special Rapporteur on Contemporary Forms of Slavery has similarly identified the XUAR's labour transfer system as a state-mandated form of forced labour, which in some instances "may amount to enslavement as a crime against humanity."[37]

In recent years, evidence indicates that many of the previously ubiquitous internment camps built by the PRC government between 2016 and 2020 have been closed or repurposed.[38] Nevertheless, the central government continues to expand its systemic use of state-imposed labour programs,[39] increasingly characterised by industrial transfers received by both state-owned and private entities within the XUAR, as well as cross-provincial labour transfers to state-owned or private enterprises outside the region.[40] State-imposed and -facilitated labour transfer programs in the Uyghur Region are designed to indoctrinate and transform ethnic rural labourers into "docile" industrial workers under the guise of "poverty alleviation" and "social stability."[41] The compulsory relocation of workers to allocated mines, field and factories has facilitated the forcible transfer of populations, familial separation, land expropriation, deprivation of physical liberty and ethnic, religious and cultural persecution of populations. **As such, the state-imposed labour transfer program is now a primary mechanism through which the PRC and local government agencies continue to perpetuate crimes against humanity.**

China seeks to shield the party-state's repressive apparatus from public view and present the Uyghur region as a business-friendly environment, even as the central government continues to expand its systemic use of state-imposed labour programs.[42]

In addition, even as reports indicate internment camps have suspended operations,[43] the PRC continues its campaign of mass arbitrary detention in the Uyghur Region through extra-judicial and unconstitutional sentencing of Uyghur and other minoritized people to long prison sentences. Research by the Uyghur Human Rights Project estimated that Uyghurs, Turkic and other non-Han peoples in the Uyghur Region account for more than a third (34%) of the PRC's estimated national prison population—despite constituting only 1% of the total population.[44] The shift from internment to imprisonment of Uyghur and other Turkic citizens is a key element of the Region's directive to "legalize and normalize" its human rights abuses in the interest of maintaining its repressive systems while cultivating foreign perception of the PRC as a "friendly business environment." The report's incarceration estimates, based on a comparison of prosecutions in the XUAR and the rate of incarceration in El Salvador, inform their assessment that, if it were a country, the Uyghur Region would have the highest prison rate in the world by population—an estimated 2,234 citizens incarcerated per 100,000.[45]

The scale and scope of state-imposed forced labour in the Uyghur Region is thoroughly evidenced by academic research, public reporting, and government advisories.[46] In recent years, the Forced Labour Lab, formerly hosted by the Helena Kennedy Centre for International Justice at Sheffield Hallam University, has documented substantive evidence of state labour transfers and the pervasive exposure to ongoing human rights abuses in the Uyghur Region throughout global agricultural and industrial supply chains.[47] Particularly relevant to this report, Sheffield Hallam University's "Driving Force" report identified several critical minerals as affected by state labour transfers in the XUAR.[48]

The pervasive environment of government surveillance, social control and implicit threat that characterises the Uyghur Region poses stark challenges for companies attempting to conduct due diligence based on social or labour audits. In 2020, multiple U.S. federal agencies issued a "Xinjiang Supply Chain Business Advisory," which outlined the credibility challenges to third-party audits in the Uyghur Region, including the detaining and harassment of auditors, government translators who convey misinformation, and the inability of auditors to rely on worker interviews given "the pervasive surveillance, and evidence of workers' fear of sharing accurate information."[49] The same year, five major social auditing firms ceased operations in the Uyghur Region.[50] In 2023, at least two major foreign consulting firms were targeted under the PRC's expanded anti-espionage law for due diligence activities deemed threats to national security, with office raids, employee arrests, and branch closures.[51] Even as economic and industry reports document the increasingly coercive business environment under the current legal regime, Beijing's public position opposes "any attempt to denigrate or attack its business environment by misreading the country's counter-espionage law."[52]

Spokespeople for the PRC government have repeatedly claimed that forced labour in the XUAR is "the lie of the century concocted by anti-China forces to create forced unemployment and poverty in Northwest China's Xinjiang Uyghur Autonomous Region."[53]

MILITARY-CIVIL FUSION: THE XINJIANG PRODUCTION AND CONSTRUCTION CORPS

The Xinjiang Production and Construction Corps (新疆生产建设兵团, "XPCC," or the "bingtuan") is a paramilitary enterprise integral to the CCP's development and implementation of repressive policies in the region, including state-imposed forced labour.[54] The XPCC is subject to U.S. Treasury Department sanctions as "a paramilitary organization in the XUAR that is subordinate to the Chinese Communist Party (CCP)... [and] enhances internal control over the region by advancing China's vision of economic development in XUAR that emphasizes subordination to central planning and resource extraction."[55] In June 2021, the XPCC was added to the U.S. Bureau of Industry and Security (BIS) Entity List, in connection with "forced labor involving Uyghurs and other Muslim minority groups" in the Uyghur Region.[56] It was also added to the Uyghur Forced Labor Prevention Act Entity List under multiple statutory provisions, including as an entity engaged in the mining, production or manufacture of goods with forced labour, an entity working with cross-provincial labour transfers, a participant in "poverty alleviation" programs, and an exporter of products tainted with forced labour to the United States.[57] The XPCC controls significant land, facilities, logistics and investments in the critical minerals sector.

The Purpose of this Report

This report is a point-in-time analysis that identifies major entities that are operating in the critical minerals sector in the Uyghur Region and documents evidence of their involvement in the labour transfer programs of Uyghurs and other Turkic people from the region. The report then identifies the risk of the products made by those entities entering the global market (insofar as publicly available sources allow) over the previous two years.

Involvement in the labour transfer program does not necessarily give rise to criminal or civil liability. However, it gives rise to a real risk of contribution to the forced labour implied by the scheme that may be the basis of such liability. In addition, supply chain exposure to the Uyghur Region could result in legal risk if the products are exported to countries where legislation bans the import of goods made with forced labour or goods made in whole or in part in the Uyghur Region. The purpose of conducting this research is to provide the trade community, governments, civil society organisations, and other stakeholders insight into the activities in the Uyghur Region and an understanding of how supply chains may be connected to the region's materials. The report is designed to assist in due diligence and supply chain tracing efforts and to contribute to public debate on the topic but does not qualify as, nor should it be construed as, legal advice.

This report focuses on four critical minerals—**titanium**, **lithium**, **beryllium**, and **magnesium**—that are mined, processed, and further manufactured in the Uyghur Region. The research identifies evidence linking corporate networks operating in the region to state-imposed labour transfer programs or other potentially coercive government employment schemes. Downstream tracing of affected companies' supply chains indicates elevated risk of exposure to products that may have been produced in the Uyghur Region in numerous sectors essential to global commerce and international security.

METHODOLOGY

Consistent with ILO Guidance, the findings of this report rely on the review of "academic articles, reports from prior national or sectoral surveys, programme evaluations, qualitative studies by NGOs or civil society groups, and investigative journalism reportages."[58] Further, based on publicly available data sources including corporate annual reports, websites, publicity campaigns, government directives, state media, and shipping records, this report identifies critical minerals mined, processed, or further manufactured in the Uyghur Region, and traces downstream supply chains through the global market.

Identifying the scale of corporate exposure to the Uyghur Region is made more challenging by the opacity of mineral supply chains. Authoritative data sources on PRC mining and minerals processing are limited due to domestic national security sensitivities and increasingly obscured trade data related to the Uyghur Region,[59] and information on crit-

ical minerals is no exception. Several business trends in the minerals and metals sector further obscure the visibility of supply chain exposure to the XUAR, including the distribution of these materials by commodities traders and e-commerce sites; a focus on OEM production rather than finished products that are more traceable; censorship of state, local, and corporate media; and the industry's expansion into economic zones designed to facilitate unimpeded foreign trade and investments in the Uyghur Region.

As governments, companies, and consumers are increasingly excluding products made in whole or in part in the Uyghur Region, this report identifies sourcing relationships with those companies that mine, produce, or manufacture in the region. For supply chain exposure analysis, this report relies on the companies' own disclosures and marketing, as well as on international shipping records dating back to April 2023. Readers should note that, due to the opacity of supply chains, the number of companies exposed to the Region through global mineral supply chains certainly far exceeds those listed in this report.

All companies identified in the report were given the opportunity to respond. Their responses can be found in the Corporate Responses Annex on the webpage for this report.

UNDERSTANDING RISK

Because of the pervasive environment of state coercion in the Uyghur Region, all companies operating in the XUAR are at high risk of directly or indirectly participating in labour transfers or other coercive government programs targeting the Uyghur and other persecuted populations. Under the UFLPA, all products mined, produced or manufactured in whole or in part in the XUAR are presumed to be made with forced labour, and companies can be individually prohibited from importing goods into the U.S. and can even be prohibited from importing for sourcing from the XUAR. Furthermore, under existing and pending international legislation including in Canada and the EU, companies operating in or sourcing from the region may also be at risk of having goods deemed ineligible for import. Thus, this report identifies companies operating in the region as well as their likely downstream customers and considers as high-risk any operations in the region as well as any sourcing, directly or indirectly, from the region.

A COAL-BASED ECONOMY

Approximately 40% of China's coal reserves are located in the XUAR.[60] One of the reasons minerals processing and industrial manufacturing has moved to the Uyghur Region is that many companies seek to take advantage of the low cost of coal-based energy for energy-intensive production. This means that products made of Uyghur Region inputs often have extremely high carbon footprints.

A NOTE ON PREVIOUS RESEARCH

This report builds on a substantial body of existing research documenting the risk of forced labour in the Uyghur Region and the exposure to the region throughout critical mineral supply chains. Investigations conducted by Sheffield Hallam University, Horizon Advisory, and Human Rights Watch detail the exposure of **aluminium** to the XUAR through production, processing, and further manufacturing in the region, particularly in the automotive sector.[61] Reporting from Sheffield Hallam University on solar supply chains uncovered evidence of links to the XUAR, including in the extraction and processing of **silicon** in the production of polysilicon.[62] Evidence of widespread participation in state labour transfer programs by the region's largest state-owned enterprises in the mining and processing of **nickel**, **copper** and **zinc** has been documented by various media, academic, and other investigative reports.[63] Recent research published by C4ADS focuses on exposure to the XUAR through **gold** mining and processing in the Uyghur Region. In addition to identifying hundreds of western companies sourcing gold from the XUAR, the "Fractured Veins" authors construct a moment-in-time geographic map of mineral rights and licenses in the XUAR mining industry. Using publicly available mining licenses and corporate data, C4ADS constructs a baseline level of visibility into the scope of potential mining activity in the region and identifies the ultimate beneficial owners of those mineral interests.[64]

Readers interested in Uyghur Region exposure in critical minerals supply chains are advised to review those reports in addition to this one.

Figure 2: At work at Xinjiang Jinsheng Magnesium. Credit: Hami Zero Distance.

Critical Minerals and the Uyghur Region

Defining Critical Minerals

There is no single international definition or harmonised standard for "critical minerals." Rather, the world's major economies have developed distinct national and regional policies governing minerals and materials designated as "critical," "essential," or "strategic."[65] National policies operate under varying objectives and typically evaluate criticality based on criteria specific to the jurisdiction's strategic priorities, resource constraints, and supply chain vulnerabilities.[66]

The PRC, for instance, maintains a "catalogue of strategic minerals" ("战略性矿产目录"), first promulgated in China's National Mineral Resources Master Plan (2016–2020) to ensure "national economic security, national defence security, and the development needs of strategic emerging industries."[67] The Plan includes within its goals the overarching industrial strategy to establish a "basic development structure for the mutual coordination of resource development, economic and social development, and ecological and environmental protection"[68] The current National Mineral Resources Master Plan (2021–2025) expands the catalogue to include 36 strategic minerals.[69]

The U.S. definition of "critical mineral," as it applies to the USGS Critical Minerals List, was codified in statute by the Energy Act of 2020.[70] The U.S. 2022 Critical Minerals List, currently in effect, expanded its scope to include 50 critical minerals.[71] In 2024, the PRC was the leading producer of at least 30 of the listed critical minerals.[72]

In the absence of a universal definition of critical minerals, this report defers to the U.S. standard when discussing factors relevant to mineral criticality, i.e.: minerals, elements and materials that are "essential to economic or national security," have "supply chains...vulnerable to disruption," and serve an essential role in the production of goods consequential to economic or national security.[73] Nonetheless, findings in the report reflect a cognizance of the international designations and have largely focused on those minerals that are both internationally critical and significant to the Uyghur Region.

Figure 3: Steel and aluminum smelting at Baowu Group Xinjiang Bayi Iron and Steel Co., Ltd. Source: Tianshannet

TABLE 1. MINERAL INCLUSION ON INTERNATIONAL CRITICAL/STRATEGIC MINERALS LISTS[74]

	US	PRC	EU	INDIA	JAPAN	ROK	UK	AU	NATO
Titanium	✓	✓	✓	✓	✓	✓		✓	✓
Lithium	✓	✓	✓	✓	✓	✓	✓	✓	✓
Beryllium	✓	✓	✓	✓	✓			✓	✓
Magnesium	✓		✓		✓	✓	✓	✓	

Key Critical Minerals Mined or Processed in the Uyghur Region

This report examines four critical minerals that are mined and/or processed in the Uyghur Region that are significant to global manufacturing and commerce: **titanium**, **lithium**, **beryllium**, and **magnesium**. The report also briefly touches upon **vanadium**. These minerals represent significant investments on the part of the regional and PRC central governments, as well as high risk for global supply chains. As mentioned in the introduction, other reports have explored aluminium, silicon, nickel, copper, gold, and zinc in the XUAR.

The table below represents critical minerals that are mined or processed in the Uyghur Region, including those discussed in this report, as well as others that have been covered elsewhere. These figures are estimates based on best available data at the time of publication, featuring the minerals and products that are most relevant to XUAR production.

Figure 4: The vanadium-titanium magnetite ore smelting workshop of Xinjiang Da'an Special Steel Co., Ltd. Photo by Nie Chao. Source: Xinjiang Daily.

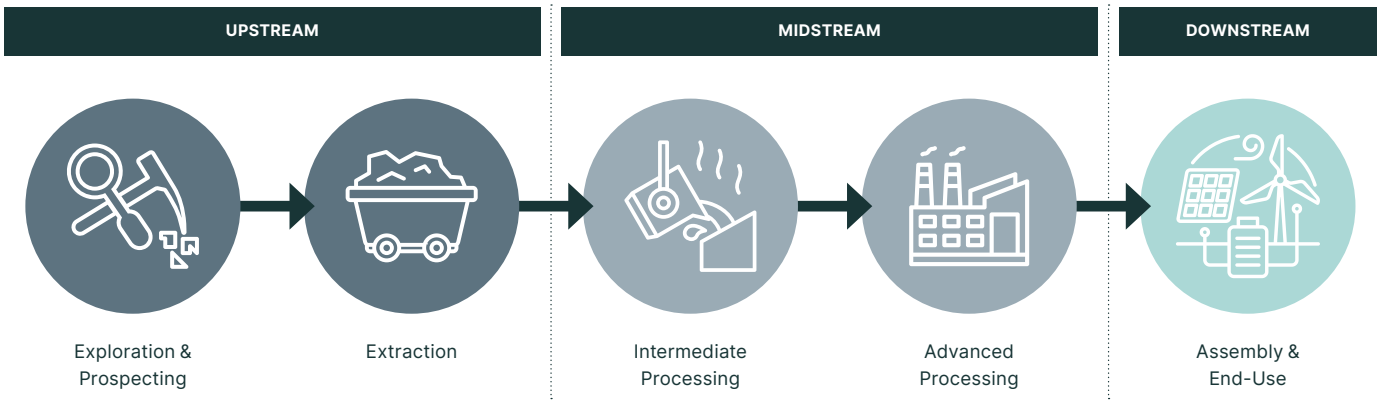
TABLE 2. MINERAL PRODUCTION 2024[75]

PRODUCTION TYPE	WORLD TOTAL	PRC PRODUCTION	PRC PERCENT OF WORLD TOTAL	XUAR PRODUCTION	XUAR PERCENT OF PRC	XUAR PERCENT OF WORLD
Titanium Sponge	320,000 tons[76]	220,000 tons[77]	69%	37,000 tons[78]	16.8%	11.6%
Titanium Concentrate	9.4 million tons[79]	3.3 million tons[80]	35%	148,400–241,500 tons[81]	4.5—7.4%	1.6—2.6%
Lithium Carbonate Equivalent (LCE)	~1.2 million tons[82]	670,000 tons[83]	55.8%	18,205.8 tons[84]	2.7%	1.5%
Mined Beryllium	360 tons[85]	77 tons[86]	21%	37.5 tons[87]	50%	11%
Smelted Magnesium	1 million tons[88]	950,000 tons[89]	95%	52,800 tons[90]	5.6%	5.3%
Gold	3,300 tons[91]	380 tons[92]	12%	11.894 tons[93]	3.1%	< 1%
Mined Zinc	12 million tons[94]	4.0 million tons[95]	33.3%	149,532 tons[96]	3.7%	1.2%
Electrolytic Aluminium	72 million tons[97]	43 million tons[98]	59.7%	6.4207 million tons[99]	14.9%	8.9%

The downstream applications of the critical minerals examined in this report and others mined or processed in the XUAR are identified as essential to nine broad strategic sectors:

	Sector	Materials Created	Minerals Needed
ECONOMIC SECURITY	**Industrial Manufacturing**	Steel & alloy manufacturing; auto manufacturing; industrial equipment manufacturing; coatings; critical minerals processing; chemicals processing.	Ti Titanium, V Vanadium, Mg Magnesium, Ni Nickel
	Construction	Refractory materials necessary for steel, aluminum, and other infrastructure metals production; paints and architectural coatings; processed inputs for alternative energy infrastructure projects.	Ti Titanium, V Vanadium, Mg Magnesium, Z Zinc
	Consumer Goods & E-Commerce	Insulated thermal cups; paints; kitchenware; consumer electronics.	Ti Titanium, Li Lithium, Mg Magnesium, Cu Copper
	Medical & Pharmaceutical	Active Pharmaceutical Ingredients (APIs); medical imaging (x-ray) technology; biocompatible implants; pacemakers.	Ti Titanium, Li Lithium, Be Beryllium, Mg Magnesium, U Uranium, Z Zinc
NATIONAL SECURITY	**Aerospace**	Civilian aircraft; military aircraft; UAVs (drones); satellites; spacecraft.	Ti Titanium, Be Beryllium, Mg Magnesium, Cu Copper, U Uranium, Z Zinc
	Defence	Radar; communications; jet planes; missiles; tanks; nuclear weapons.	Ti Titanium, Be Beryllium, U Uranium, Z Zinc
	Information & Communication Technology (ICT)	Semiconductors, telecommunications, data centers, optic cables.	Ti Titanium, Be Beryllium, Cu Copper, Z Zinc
ADVANCED TECHNOLOGIES	**Alternative Energy**	Solar, wind, hydrogen, and nuclear energy generation; energy storage batteries.	Ti Titanium, V Vanadium, Li Lithium, Be Beryllium, Cu Copper, U Uranium, Z Zinc
	AI & Data Processing	Data centers; quantum computing; power infrastructure.	Ti Titanium, V Vanadium, Li Lithium, Be Beryllium
	E-Mobility & Electric Vehicles	Electric bicycles, scooters, passenger vehicles, commercial vehicles, tractors, and mining equipment.	Li Lithium, Mg Magnesium, Cu Copper, Ni Nickel, Z Zinc

FIGURE 5. CRITICAL MINERALS VALUE CHAIN



Critical Minerals Expansion in the Uyghur Region

The PRC holds a dominant position over at least one strategic point in many critical mineral value chains.[100]

The PRC has significantly expanded its access to raw mineral resources through domestic exploration and foreign direct investment in recent years.[101] The PRC has long prioritised strategic mineral resource planning, promoted in the 2010s in conjunction with its "Going Out" (走出去) policy to encourage overseas investment by Chinese enterprises.[102] Since 2013, the development of strategic trade routes and economic cooperation with resource-rich countries along the Belt and Road Initiative have expanded the PRC's mining access and domestic processing industry.[103]

The mining industry is a pillar of the XUAR economy.[104] Even as international condemnation of the CCP's atrocity crimes in the Uyghur Region has evolved to legislative action, the XUAR's broad preferential trade and investment policies have successfully consolidated the labour-intensive and often hazardous work of mineral extraction, production and processing in the region. Five-Year Plans at the national and regional level have prioritised the expansion of the critical minerals industry in the Uyghur Region. The central and regional governments explicitly list mineral exploration, capacity development, and downstream industrial expansion targets to consolidate industrial value chains in the Uyghur Region.[105] **As of June 2024, the added value of the mining and downstream industries accounts for about 75% of the XUAR's total industrial added value.**[106] In 2025, the XUAR announced that the exploration targets issued under the "14th Five Year Plan" were either met or surpassed, with the region's investment in geological exploration projects set to nearly double this year.[107]

The Uyghur Region's geography and resources make it key to the PRC's Belt and Road Initiative.[108] The region's strategic geography was described in 2023 by the State Council in its plan for the Xinjiang Free Trade Pilot Zone as "five ports connecting eight countries and one road connecting Europe and Asia."[109] Mining and minerals trade have driven massive infrastructure and logistics development projects designed to encourage foreign trade with and through the Uyghur Region.[110] Industrial planning has focused on extending the region's capacity throughout the minerals industrial chain, directing investments in strategic mineral sectors toward exploration, extraction, production, and further processing, as well as downstream industries necessary to expand upstream operations, like the manufacturing of mining and heavy equipment and R&D necessary to secure technological capacity.[111] Access to rich resource reserves, cheap energy, and significant incentives programs serve to insulate companies mining in the Uyghur Region from typical market challenges,[112] further advancing the PRC's ability to dominate global supply chains.

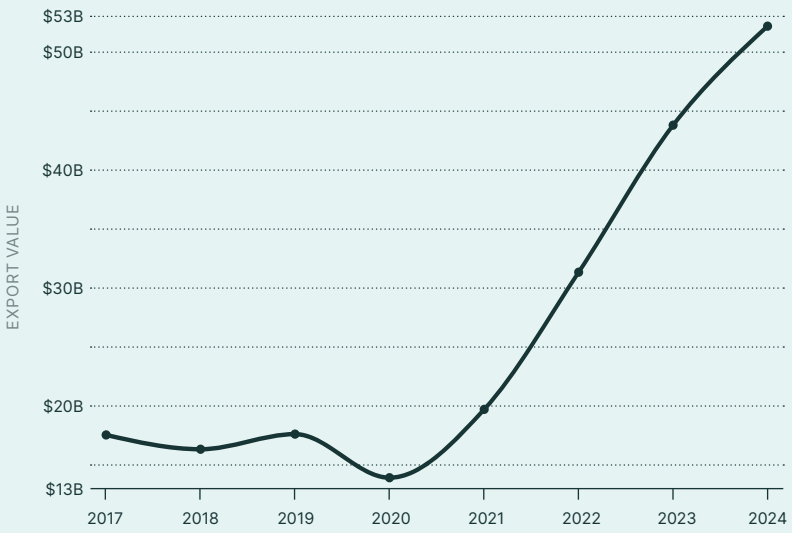
The XUAR and central governments have also expended significant resources for the development of the logistics infrastructure that facilitates the movement of critical minerals (and other products) into and out of the Uyghur Region. One such mechanism is the region's Comprehensive Bonded Zones, which are special customs supervision zones and trade platforms designed to promote and facilitate industrial transfer and export processing. In 2023, the first outward foreign investment from the Kashgar area of the XUAR Free Trade Zone was launched through its international warehouse in Bishkek, Kyrgyzstan, which allows for overseas goods storage, circulation and processing, and has its own railway lines and customs declaration and inspection sites.[113] The Authorized Economic Operator (AEO) certification program grants domestic enterprises access to various preferential customs programs, including expedited clearance, reduced inspections, lower costs, and recognition of PRC AEO status to access mutual benefits in partner countries.[114] The XUAR's four comprehensive bonded zones in Urumqi, Kashgar, Horgos, and Alatav Eghizi (Ch: Alashankou) accounted for **40.7% of the XUAR's total trade import and export value** from January to October 2024.[115]

The CCP's increasing investments in mineral exploration in the Uyghur Region have yielded significant results: as of July 2024, 153 types of minerals were identified in the region, which account for 88% of the types found in China. One hundred and three of those have proven reserves. Among the proven resource reserves, 77 rank among the top ten most significant reserves of that mineral in the country.[116]

UYGHUR REGION EXPORTS ON THE RISE

In 2024, the PRC government claimed that the Uyghur Region's trade activity increased 21.8% over the previous year, totalling a record 435.11 billion yuan (approximately $59.98 billion USD).[117] According to those statistics, the United States was the fifth largest export market by value, totalling a 283.1% increase year-over-year. The value of exports from the Uyghur Region to the United Kingdom rose 595.2%; exports to Poland saw a striking 811.5% increase.[118] Total import and export volumes to members of the Regional Comprehensive Economic Partnership (RCEP) and the Association of Southeastern Nations (ASEAN) increased 167.8% and 191.9% year-over-year, respectively.[119]

TABLE 3. XINJIANG UYGHUR AUTONOMOUS REGION EXPORTS OVER TIME



Source: Observatory of Economic Complexity

The sector seems poised to grow even further in the coming years. In 2024, the XUAR announced plans to increase its own financial investments in strategic minerals from 150 million yuan to 500 million yuan, and to establish the Xinjiang Mineral Resources Risk Exploration Investment Fund to "leverage private funding participation."[120] Furthermore, several major mining companies identified in previous research on the Uyghur Region are increasing their investments in the region. Zijin Mining, a company that has been added to the US's UFLPA Entity List, has publicly announced it will continue to increase its investment in the XUAR, and "continue to accelerate the transformation of advantageous mineral resources into social and economic benefits, and help Xinjiang build a modern industrial system."[121] Additionally, Xinfa Group Co., Ltd. announced plans to invest more than 100 billion yuan in the XUAR and provide employment for nearly 10,000 local people.[122]

As this report will reveal in the chapters that follow, in recent years, policy and financial incentives have driven significant direct investments in key mineral supply chains and downstream industries, often from companies outside the region seeking to secure raw material supplies. Long-term investments in the exploration and exploitation of mineral resources in the Uyghur Region have increasingly reached commercial production capacity in recent years, promoting downstream industrial investment through regional access to (often subsidised) raw materials. As the XUAR expands control over upstream and midstream minerals processing, market influence and supply chain opacity increase the risk of exposure in global supply chains to Uyghur forced labour and other repressive government programs. State control over data access, mineral resources, and commercial activity obscures traceability to the PRC's activities in the Uyghur Region, creating complex networks of subsidiary and trade networks. This advances the CCP's ambition to shift labour-intensive, often hazardous industries to the XUAR, sustaining the party-state's repressive tactics through coercive and forced labour.

22
Ti
47.867

Titanium 钛

The PRC is the world's leading producer and consumer of titanium products.[123] The PRC's domestic titanium ore resources predominately exist in the form of ilmenite, found in vanadium titanomagnetite (VTM) reserves. In 2024, the PRC remained the leading producer and consumer of titanium concentrate, accounting for approximately one third of global ilmenite production and importing over 4 million tons of titanium concentrate for the world's largest processing and downstream manufacturing of titanium dioxide and titanium metal products.[124] Titanium dioxide is widely used in industrial processes and commercial products, including paint, fabrics, plastics, paper, food and cosmetics.[125] Titanium sponge is key to strategic industries, with automotive, alternative energy, and aerospace applications. Between 2018 and 2023, the PRC's share of global titanium sponge output increased from 37% to 67%.[126]

While Sichuan Province hosts the world's largest vanadium-titanium magnetite deposit, the PRC has prioritised the westward expansion and extension of the full titanium industrial chain in the Uyghur Region.[127]

The Uyghur Region is a significant producer of titanium sponge, the feedstock for titanium metal production and a defining point in the value chain of automotive, aerospace, medical, and consumer titanium applications. In 2024, Qumul (Ch: Hami) prefecture of the Uyghur Region alone produced 37,000 tons of titanium sponge, accounting for approximately 17% of China's titanium sponge and nearly 12% of global production.[128]

The Uyghur Region is rich in ilmenite-bearing vanadium titanomagnetite (VTM) resources. Over the last decade, PRC and regional government policies have promoted the development of the titanium industry in Qumul, powered by cheap fossil fuels.[129] The "titanium new materials industry" is one of the six leading industries in Qumul, which the local government claims makes Qumul a "world titanium city." By 2025, the city anticipates an annual production scale of "500,000 tons of titanium concentrate, 100,000 tons of titanium sponge, and 50,000 tons of titanium and titanium alloys," which the city claims will make it the PRC's largest titanium producer.[130]

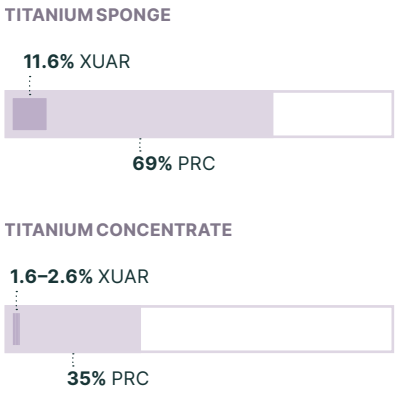
Anticipated Growth

Recent announcements suggest that titanium mining is set to expand rapidly in the XUAR. In September 2024, a new vanadium-titanium magnetite deposit was discovered in the main titanium area of Qumul, reported to contain 21.5 million tons of titanium resources.[131] In January 2025, Kalpin County (Ch: Keping) announced the discovery of an estimated 50 million tons of ilmenite resources.[132]

Furthermore, investments in the titanium and vanadium industries are set to further expand the region's production along each stage of the industrial chain. In June 2024, Baoji Yucai Glass (Group) Co., Ltd. and the People's Government of Atush (Ch: Atushi) City signed a 40,000-ton aviation-grade sponge titanium and titanium-based new materials project.[133] As of 2024, both projects remained under construction. Other PRC firms and XUAR local governments have similarly expanded investments in the titanium and downstream battery industrial chains.

TITANIUM:

Global Production Share



Supply Chain

UPSTREAM:

Titanium concentrate is primarily extracted from ilmenite ($FeTiO_3$). In the PRC, vanadium is often mined as a co-product from vanadium titanomagnetite reserves, or a by-product of tailings slag.

MIDSTREAM:

The vast majority of titanium is processed for the production of titanium dioxide, with less than 10% further manufactured into titanium metals and alloys.[135] Titanium metal is generally produced using the "Kroll process," an energy-intensive method by which magnesium is often used to create titanium metal sponge.[136] Sponge can be reprocessed to obtain rods, ingots, or titanium metal powder.[137]

DOWNSTREAM:

Titanium dioxide is primarily consumed by the paint and coatings industry. Titanium metal products undergo further manufacturing for consumption in the aerospace, marine, medical, energy, and consumer sectors.[138]

Supply Risk

DEMAND:

Demand for titanium is driven by consumption in a wide array of industries, as both titanium dioxide and titanium metal products. Titanium demand for alternative energy technologies is projected to increase by as much as 200% by 2030.[139] Roughly 85% of global titanium metal demand is driven by commercial aircraft production and industrial applications.[140]

RELIANCE:

The titanium metal supply chain is characterised by a high degree of geographic concentration: in 2024, titanium sponge production was concentrated in five countries: China, Japan, Russia, Kazakhstan, and Saudi Arabia.[141] The PRC is the largest producer and consumer of titanium, accounting for over half of the global sponge supply since 2020.[142] Today, the PRC produces more than half the world's titanium sponge and titanium dioxide, [143] a volume still insufficient to satisfy domestic consumptive demand. At least seven national policies, as well as the EU and NATO, identify titanium as a critical or strategic mineral.[144]

RESILIENCE:

Global titanium metal supply remains heavily impacted by Russia's war in Ukraine, particularly in the aerospace sector.[145] Rising geopolitical tensions between the U.S. and China create additional risks of supply chain disruption.[146] The PRC's anti-competitive trade practices threaten to constrain the development of new titanium markets, particularly titanium dioxide.[147]

SUBSTITUTABILITY:

Few effective substitutes exist.[148]

Titanium dioxide producer CHTi continues to expand its operations and investments in the XUAR to secure upstream supply of titanium and vanadium inputs for its vast downstream production. In 2023, CHTi announced it plans to establish a wholly owned subsidiary, Hami Zhonghe Vanadium Titanium Co., Ltd. (哈密中合钒钛有限公司). The company will rely on Hami Ruitai's Weiya Ilmenite Mine's nine titanium and vanadium tailing stockpiles, totalling an estimated 50.86 million tons, to produce an annual 357,500 tons of exploitable tailings and expand its raw material base.[134]

Figure 6: Titanium metal smelting scene at Xinjiang Xiangsheng New Materials Technology Co., Ltd. Photo by Guo Ziyi. Source: Xinjiang Daily.

Hunan Wujo Light Chemical Group (湖南五江轻化集团)

Hunan Wujo Light Chemical Group (湖南五江轻化集团), also translated as Hunan Wujiang Light Chemical Group) is a wholly owned subsidiary of Hunan Wujo Holdings Group, Co. Ltd. (湖南五江控股集团有限公司, "Wujo Group," also translated as Hunan Wujiang Holdings Group), which is headquartered in Hunan. The Wujo Group is ranked among the "Top 500 Manufacturing Private Enterprises in China,"[149] and its sprawling corporate network includes over 30 production enterprises and trading companies.[150] According to the Wujo Group's corporate website, the company exports to over 100 countries, totalling $50 million in houseware exports in 2023.[151]

The company claims its titanium production as the second largest in China and the third largest the world.[152]

Today, the Wujo Group controls the only titanium metal smelting and titanium alloy processing enterprise in the Uyghur Region.[153] The Wujo Group's continued expansion of its titanium operations in the Uyghur Region relies on "titanium ore and vanadium-titanium magnetite…both supplied locally in Qumul, with low costs and [government] guarantees."[154] In addition to the proximity of raw materials, cheap and ready access to coal power subsidizes the energy-intensive processing costs associated with titanium production.[155]

The Wujo Group's investments in the Uyghur Region date at least to its 2001 establishment of Wujiang Light Chemical's wholly owned subsidiary **Xinjiang Wujiang Xinghua Industrial Co., Ltd.** (新疆五江兴华实业有限公司).[156]

In 2013, the Wujo Group established **Xinjiang Xiangsheng New Material Technology Co., Ltd.** (新疆湘晟新材料科技有限公司) in the Southern Circular Economy Industrial Park in the Qumul High-Tech Development Zone. The company anticipated that in 2024, the facility's production capacity would reach levels that would mean it ranked first in China and second in the world for titanium sponge production capacity.[157]

Through its co-located subsidiaries, Xinjiang Xiangsheng has established production capacity at each stage of the titanium industrial chain. **Xinjiang Huatai New Material Technology Co., Ltd.** (新疆华钛新材料科技有限公司) was established to expand Xiangsheng's specialised titanium production capacity by 30,000 tons, guaranteeing the "key basic materials for aerospace equipment, marine engineering equipment and high-tech ships,"[158] and **Xinjiang Xianghe New Materials Technology Co., Ltd.** (新疆湘和新材料科技有限公司) produces high-titanium slag.[159] Xiangsheng also maintains a marketing and technology subsidiary in Xi'an, **Xi'an Kechenwell Metal Materials Co., Ltd.** (西安柯辰威尔金属材料有限公司), responsible for much of the company's intellectual property (discussed below), sales branches, and R&D enterprises.[160]

Xinjiang Xiangsheng's subsidiary, **Xinjiang Xiangrun New Materials Technology Co., Ltd.** (新疆湘润新材料科技有限公司, also known as XRUN) produces titanium sponge and titanium alloy processing materials. Notably, Xinjiang Xiangrun's website (xjxrun.com) uses the name Xinjiang XRUN and Xi'an XRUN interchangeably and notes that its address is in Qumul, Xinjiang while its sales location is in Xi'an, Shaanxi province.[161] Given this information, it is reasonable to believe that products sold by the Xi'an XRUN are products of the Xinjiang production base.

Vanadium

The PRC controls the world's largest vanadium reserves, and accounts for 68% of global mine production.

Titanium and vanadium are often co-occurring minerals in the ore deposits of the XUAR. Vanadium is among the most widely listed critical and strategic minerals due to its necessity for steel production and the absence of acceptable substitutes for vanadium in the production of aerospace titanium. Over 90% of vanadium is used in steel production; however, demand from the nascent vanadium battery sector has driven increased investment in the upstream and downstream segments of the vanadium value chain. Vanadium is a necessary input for aerospace titanium, with no acceptable substitutes.[162]

The XPCC-owned **Xinjiang Da'an Special Steel Co., Ltd.'s** (新疆大安特种钢有限责任公司) **subsidiary Xinjiang Sheng'an New Material Technology Co., Ltd.** (新疆盛安新材料科技有限公司) **produces roughly 3.4% of the global vanadium pentoxide supply.**[163]

PARTICIPATION IN LABOUR TRANSFERS

Wujo Group may have participated in the region's labour transfer programs through its sub-subsidiary, Xinjiang Xiangsheng, and Xiangsheng's regional subsidiaries. A 2020 Xinjiang Hunan Chamber of Commerce profile of Xinjiang Xiangsheng New Materials describes the company's actions to "solve the problem of local surplus labour," as playing a "key role in local social stability," language typically associated with government labour transfer programs.[164] A 2024 state media report quotes one Xiangsheng labourer from Kashgar above a photo captioned, "Xinjiang Xiangsheng New Materials Technology Co., Ltd. has absorbed surplus labour from southern Xinjiang to be responsible for environmental sanitation work in the park."[165] The term "absorb" is also often used in association with labour transfer programs in the XUAR.[166]

DOWNSTREAM SUPPLY CHAIN

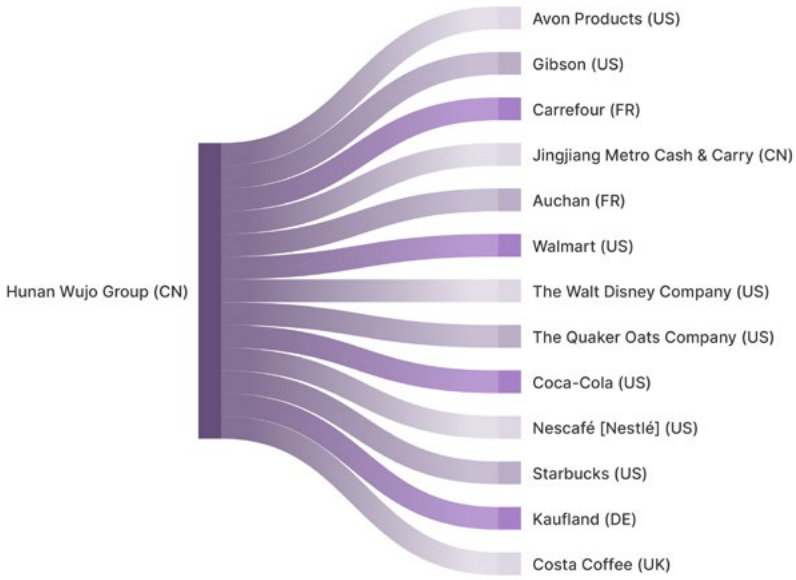
Wujo Group's trading company, Wujo International, is responsible for the import and export of Wujo Group products.[167] According to the company's marketing materials, Wujo International exports 60 million USD in goods to over 100 countries annually across North and South America, Europe, and Asia.[168]

Wujo Group's verified Alibaba page indicates that its "cooperative partners" include **Avon**, **Gibson**, **Carrefour**, **Metro**, **Auchan**, **Walmart**, **Disney**, **Quaker**, **Coca-Cola**, **Nescafe**, **Starbucks**, **Kaufland**, and **Costa Coffee**.[169] The company indicates explicitly that it is the "supplier of global commerce chains," Auchan, Walmart, Kaufland, and Carrefour.[170]

While this report focuses on critical minerals, Wujo Group produces a far wider variety of products in the XUAR. Wujo Group's website states that its sales of glass-lined insulated containers account for 38% of the national market share—and "the highest production and sales volume in the world." The products appear to be sold sometimes under the "Wujiang" brand name. The same paragraph notes that the company has one of its four "production bases" in the XUAR, suggesting that they make those insulated containers in the XUAR.[171] This indicates a risk of exposure to the XUAR across Wujo's range of consumer goods produced with titanium inputs.

Wujo Group subsidiary Xinjiang XRUN was designated a "key export enterprise in Qumul City," and as such has reaped significant tax benefits, including the recovery of export tax on titanium plates (used in consumer and industrial applications) destined for the UK and South Korea,[172] which suggests these countries are destinations for Xinjiang XRUN's exports.

Records from the World Intellectual Property Organization confirm Xinjiang Xiangrun New Material Technology Co., Ltd. (新疆湘润新材料科技有限公司) continues to increase its intellectual property ownership as the listed applicant for 128 published titanium-related patents between 2017 and 2025.[173] Published patents cover various applications, including titanium alloy material for armoured vehicles[174] and ultrathin titanium strip for hydrogen fuel cells.[175] Xi'an Kech-



Hunan Wujo Group downstream supply chain risk.

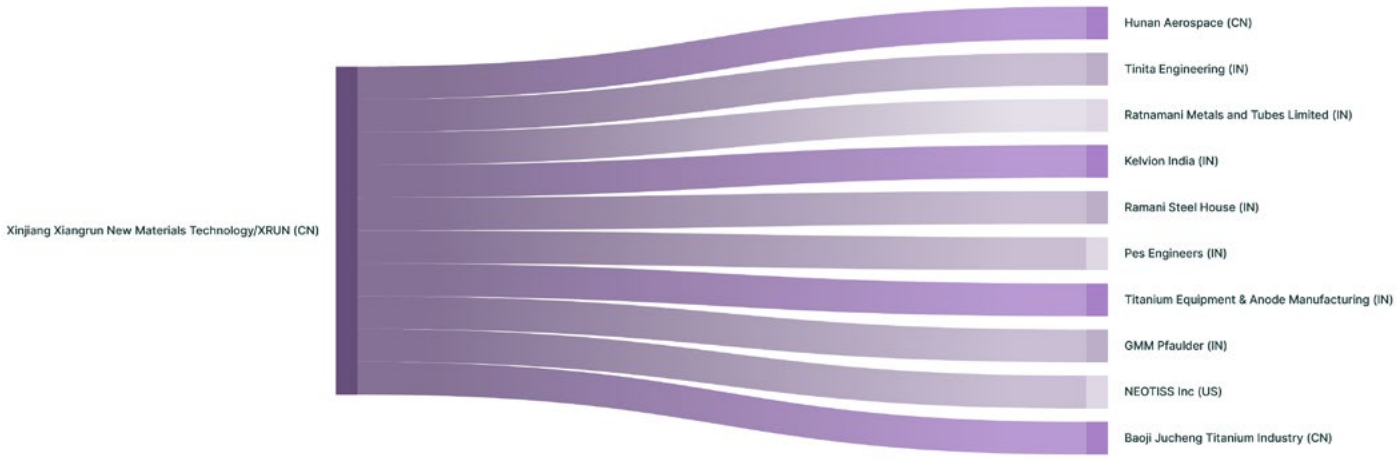
enwell, the marketing and distribution subsidiary of Xinjiang Xiangsheng, owns patents related to downstream consumer applications, including titanium vacuum cups.[176]

Xinjiang XRUN, often through its Xi'an XRUN sales location described above, is a key supplier of titanium sponge to downstream domestic producers outside the Uyghur Region, as well as a direct exporter of titanium materials to foreign markets. For instance, an e-commerce advertisement suggests that Xinjiang XRUN exports XUAR-origin titanium through Baoji, Shaanxi Province (an important titanium producing area) and Wuxi, Jiangsu Province,[177] which could obscure the Xinjiang origin of the titanium in the products.

Xinjiang XRUN is a significant supplier of titanium products in both domestic and global energy, industrial, and intermediate manufacturing markets. In 2022, the company reported export of nearly 500 tons of titanium strip, mainly distributed in Southeast Asia, Europe, the United States, Japan and South Korea.[178] Shipping records show XRUN shipped approximately $1.76 million in titanium products, including to **Tinita Engineering Private Ltd.** (IN), **Ratnamani Metals & Tubes Ltd.** (IN), **Titanium Equipment & Anode Manufacturing Company Ltd.** (IN), **Ramani Steel House** (IN), **Pes Engineers Private Ltd.** (IN), **Kelvion India Private Ltd.** (IN), and **GMM Pfaudler Ltd.** (IN).

Xinjiang XRUN maintains a visible market presence as a titanium supplier in the aerospace industry, including through the sponsorship of key trade exhibitions like the 2024 Farnborough International Air Show in the United Kingdom.[179] As of 2023, Xi'an XRUN New Material Co., Ltd., the sales office of Xinjiang XRUN, was listed on the International Titanium Association Member Roster.[180] Additionally, records show Xi'an XRUN made shipments including titanium to Neotiss Inc. (US) in the United States.[181] Neotiss, with locations in France, the US, China, and India, produces tubes for the aerospace industry, among others.[182] Xinjiang Xiangrun recently obtained its National Aerospace and Defence Contractors Accreditation Program (NADCAP) certification in non-destructive testing,[183] an industry-led certification program for suppliers to globally significant aerospace companies.[184] In December 2023, Xinjiang Xiangsheng entered into a strategic cooperation agreement with Hunan Aerospace (湖南航天).[185]

Corporate documents identify Xinjiang XRUN as a top supplier to **Baoji Jucheng Titanium Industry Inc.** (宝鸡巨成钛业股份有限公司) since 2023.[186] That year, Xinjiang XRUN accounted for roughly 46% of Baoji Jucheng's titanium purchases; as of June 2024, XRUN accounted for more than half the company's raw material expenses.[187] Baoji Jucheng's main products include "titanium plate, pipe, ingot, bar, titanium products, clad material, and titanium equipment"[188] sold into the domestic and international markets. In 2023, Bao-



Xinjiang Xiangrun New Materials Technology/XRUN downstream supply chain risk.

ji Jucheng's top two customers accounted for over 40% of sales: **Xi'an New Energy Technology Co., Ltd.** (西安泰金新能科技股份有限公司) and **Shanghai Zhaosheng Mechanical and Electrical Equipment** (上海昭晟机电设备有限公司). Public shipping records show Baoji Jucheng has supplied titanium-based products to Vietnam- and India-based distributors and manufacturers over the past two years, including **Dtp Technology Engineering Jsc** (VN), **Horizon Titanium Inc.** (IN), **Nickel Alloy India** (IN), **Manhar Metal Supply Corporation** (IN), **Rajguru Steel & Alloys** (IN), and **Divyanidhi Nickel Alloys** (IN).[189]

In addition to domestic supply partnerships and foreign exports, Wujo Group's expanding titanium capacity is set to serve the development of other provinces' titanium industries, including Loudi City in Hunan. In March 2025, based on the "large-scale vanadium-titanium magnetite with proven reserves in Qumul, Xinjiang, and the advantages of high-quality and low-cost energy," Wujo Group agreed to support the development of Loudi City's titanium industry by providing "a stable, sufficient, and cost-effective supply of raw materials."[190]

CNNC Hua Yuan Titanium Dioxide Co., Ltd./"CHTi" (中核华原钛白股份有限公司)

CNNC Hua Yuan Titanium Dioxide Co., Ltd. (中核华原钛白股份有限公司, "CNNC Titanium Dioxide" or "CHTi") is a key investor in the Uyghur Region's titanium industry and a significant downstream consumer and distributor of rutile titanium dioxide sourced from the region. According to corporate marketing materials, **CHTi is the second largest producer of rutile titanium dioxide ("TiO2" or, "titanium white") in the PRC**.[191]

In 2020, CHTi established **Xinjiang Desheng New Materials Technology Co., Ltd.** (新疆德晟新材料科技有限公司) as a holding subsidiary and investment vehicle.[192] Shortly after its formation, Xinjiang Desheng entered into an Investment Promotion Agreement with the Qumul Municipal Government.[193] Under the agreement, the Desheng joint venture agreed to construct a "circular economy industrial park" in exchange for, among other services, the government's construction of necessary logistics, energy, and water infrastructure.[194]

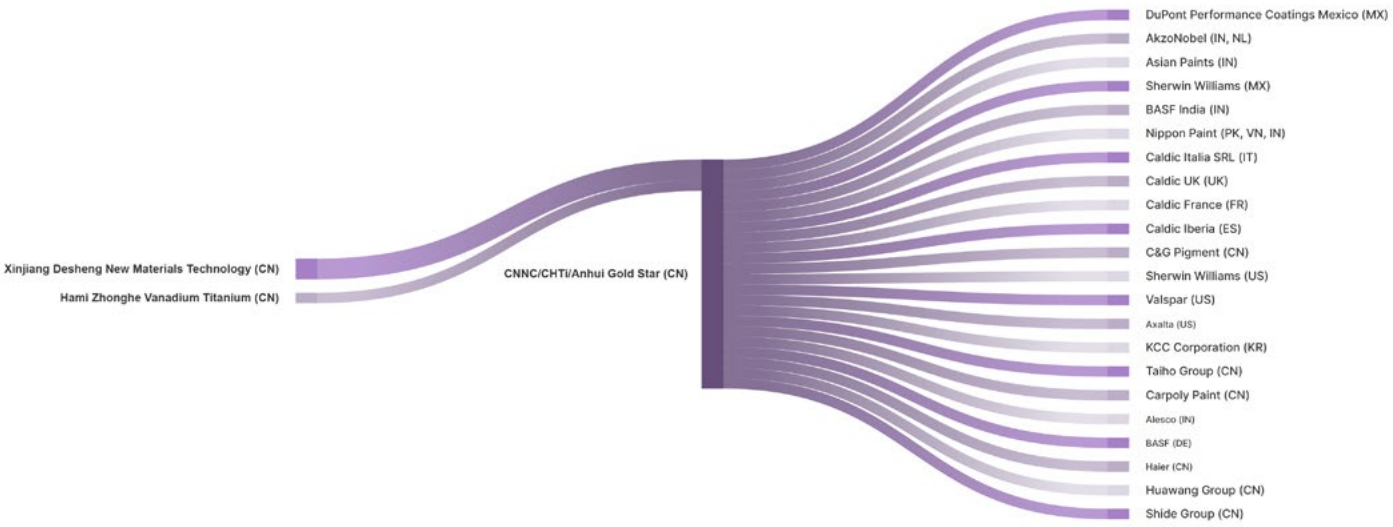
Corporate reports confirm CHTi sources its primary titanium resources, under long-term supply contracts, from titanium ore producers in the XUAR, including from its own industrial park in Qumul, described above.[195] In state media, CHTi has referenced the Uyghur Region as an important supply area for the company's raw material titanium concentrate.[196]

According to CHTi's 2024 Annual Report, the company purchased approximately 320,000 tons of titanium concentrate under its "long-term exclusive supply cooperation relationship with a titanium concentrate producer in the northwest region"[197] (which is a common way of referring to the XUAR), which is sufficient for roughly 128,000 tons of rutile titanium dioxide.[198] Based on the company's total 2024 yield of titanium dioxide, **roughly 28% of CHTi's titanium dioxide is produced with titanium concentrate mined in the Uyghur Region**.[199] This suggests that sourcing products made with CHTi's titanium dioxide presents a significant risk of exposure to the XUAR.

DOWNSTREAM SUPPLY CHAINS

CHTi lists among the "brands we work with" global paint brands **Sherwin Williams** (US), **Valspar** (US), **Axalta** (US), **KCC Corporation** (KR), **Taiho Group** (CN), **Carpoly Paint** (CN), **AkzoNobel** (NL), **Alesco** (IN), **BASF** (DE), as well as other industrial chemical and manufacturing companies such as **Haier** (CN), **Huawang Group** (CN), and **Shide Group** (CN).[200]

In a pre-publication response, BASF asserts that "BASF has not had a business relationship with CNNC Hua Yuan Titanium Dioxide Company Ltd. (CHTi) since 2018, when we last sourced from them", and claims that "at the time, this accounted for less than 0,2% of the total purchase value in this



CNNC Hua Yuan Titanium Dioxide Co., Ltd. downstream supply chain risk.

product category."[201]

CHTi wholly owns **Anhui Gold Star Titanium Dioxide Trading Company Ltd.** (安徽金星钛白销售有限公司),[202] which appears to be the subsidiary through which the company's titanium dioxide products are exported globally, primarily for downstream use in the coatings and paint industry. Shipping records indicate that Anhui Gold Star exports titanium dioxide to major international paint companies (at times under the CHTi brand Tioxhua),[203] including **DuPont Performance Coatings Mexico** (MX), **AkzoNobel** (IN), **Asian Paints** (IN), **Sherwin Williams** (MX), **BASF India** (IN),[204] and **Nippon Paint** (PK, VN, IN),as well as **Caldic Italia** (IT), **Caldic UK** (UK), **Caldic France** (FR), and **Caldic Iberia** (ES).[205] Caldic's website states, "We're excited to feature our Anhui Gold Star Titanium Dioxide range" at the European Coating Show 2023.[206]

C&G Pigment, a Zhejiang-based export marketing company for inorganic pigment, lists CHTi as their exclusive supplier of titanium dioxide.[207]

3
Li
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Lithium 锂

The secure and stable supply of lithium has emerged as a global priority for governments and industry alike in recent years. Rising demand is driven by energy transition technologies, particularly electric vehicles and energy storage systems. Since 2016, the PRC, the United States, the EU, Australia, and NATO have recognised lithium as a critical or strategic resource.[208]

In recent years, the PRC has implemented national and regional policies dedicated to developing domestic lithium resources to mitigate its current import dependence for raw materials.[209] According to statistics from the PRC's Ministry of Industry and Information Technology (MIIT), "China's battery-grade lithium carbonate production increased 45% from 2023 to 670,000 metric tons" in 2024, and "production of battery-grade lithium hydroxide rose to 360,000 tons in 2024, a 26% increase year-on-year."[210] **In 2024, China accounted for nearly 55% of the world's lithium carbonate equivalent (LCE).**[211]

Expansion of lithium mining, processing, and downstream production in the Uyghur Region is key to PRC domestic resource development, and the region's lithium output is set to rapidly increase in coming years. The Uyghur Region is often referred to in state propaganda as the "birthplace of China's lithium industry chain."[212] With the depletion of the Koktoqay (Ch: Keketuohai) No. 3 Mine's resources, however, the Uyghur Region's lithium capacity declined significantly. An article published on the Weixin channel of the XUAR State-owned Assets Supervision and Administration Commission in 2023 noted that by 2021 "there was no Xinjiang company among the top twenty lithium carbonate producers in China, and the only remaining lithium metal company in Xinjiang, Xinjiang Asia-Europe Rare Metal Co., Ltd., was facing a shortage of basic lithium salts needed for lithium extraction."[213]

Nonetheless, the Uyghur Region is among the top PRC provinces with granite pegmatite lithium deposits.[214] The region's lithium reserves are found in salt lake brine and hard rock spodumene ore.[215] A 2025 analysis authored by representatives of the Chinese Academy of Geological Sciences describes the landscape of the region's lithium resources as "mainly concentrated in high-altitude lithium-beryllium mining areas... with an altitude of 4,500–5,000m. The terrain is complex, precipitation is abundant, geological disasters are frequent, and development is difficult. At present, many lithium mines in Xinjiang are mainly in the exploration and development demonstration stage."[216]

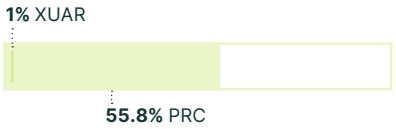
To reverse the decline in XUAR lithium production, the PRC has implemented a series of national and regional policies dedicated to the development of the Uyghur Region's lithium resources, with particular emphasis on the new energy vehicle industry.[217] The government launched a "strategic action for prospecting breakthroughs" in 2023, making lithium ore a "key exploration resource."[218]

Based on data available at the time of publication, three entities in the Uyghur Region reported lithium production output in 2024: **Xinjiang Zhicun New Energy Materials Co., Ltd.** (新疆志存锂业有限公司), **Xinjiang Asia-Europe Rare Metal Co., Ltd.** (新疆亚欧稀有金属股份有限公司), and **SDIC Xinjiang Lithium Co, Ltd.** (国投新疆锂业有限公司).

LITHIUM:

Global Production Share

CARBONATE EQUIVALENT (LCE)



Supply Chain

UPSTREAM:

Lithium is primarily extracted from salt lake brines and hard rock ores, namely spodumene and lepidolite.[231] In the Uyghur Region, lithium resources are currently extracted from both salt lake brine and spodumene.[232]

MIDSTREAM:

The core products of midstream smelting are lithium carbonate, lithium hydroxide, and lithium chloride.[233] Lithium carbonate is the most widely used form of lithium salts.[234]

DOWNSTREAM:

An estimated 87% of lithium is used in battery production.[235] Lithium is also used in a wide range of other downstream applications, including glass and ceramics, lubricants, construction materials, pharmaceutical products, plastics, and aluminium-lithium alloys .[236]

Supply Risk

DEMAND:

Global demand for lithium[237] is driven by its critical role in lithium-ion batteries, particularly for electric vehicles and energy storage systems. Supply currently exceeds demand, which is expected to continue through 2025, but conditions are uncertain.[238]

RELIANCE:

Fastmarkets noted that the lithium market saw a 175,000-ton surplus in 2023 and an almost 154,000-ton surplus in 2024.[239] The midstream and downstream battery supply chain remains reliant on Chinese production, as "the PRC produces over three-quarters of batteries sold globally," and over 70% of all EV batteries ever made.[240]

RESILIENCE:

The lithium supply chain is highly exposed to geopolitical disruption due to high levels of geographic concentration, trade conflicts, and rising resource nationalism.[241] China remains heavily reliant on imports from Australia, Brazil, and Zimbabwe,[242] while the world remains reliant on China for its growing refining capacity. Resilience may be supported by global efforts toward lithium exploration, which have substantially increased lithium resources worldwide.[243]

SUBSTITUTABILITY:

Lithium compound substitutions exist for batteries, ceramics, greases, and manufactured glass.[244]

TABLE 3. 2024 LITHIUM CARBONATE EQUIVALENT (LCE) PRODUCTION IN XUAR

Producer	Estimated 2024 Output (tons LCE)	Feedstock
Xinjiang Zhicun New Energy Materials	11,000[219]	Rock ore
Xinjiang Asia-Europe Rare Metals	>1,634 (January–September only)[220]	Rock ore
SDIC Xinjiang Lithium	5,572[221]	Salt brine

Anticipated Growth

Despite the challenges of lithium mining in the XUAR, the region has become a focus of the PRC's lithium and lithium battery expansion ambitions. The XUAR has seen a rapid proliferation of exploration and mining rights recently, including the Tianshuihai (甜水海) lithium mine in Aksai Chin, the Longmenshan (龙门山) lithium mine outside Dahongliutan (大红柳滩) in Hotan County, and the Washixia (瓦石峡) South lithium mine in Chaqiliq (Ch: Ruoqiang) County. The rights were won by **Xinjiang Dehui Longwang Mining Co., Ltd.** (新疆德汇隆旺矿业有限公司), **Hotan Zhiyuan Mining Co., Ltd.** (和田志远矿业有限公司), and **Xinjiang Hongsheng Jiarui Mining Co., Ltd.** (新疆鸿升佳瑞矿业有限公司), respectively.[222]

Many of China's major minerals corporations have invested in lithium in the XUAR. As discussed below, Xinjiang Zhicun invested almost 2.9 billion RMB in developing subsidiaries in the region. **Risheng New Energy Materials (Xinjiang) Co., Ltd.** (日昇新能源材料（新疆）有限公司) was established in March 2023 in the lithium mining and battery-grade lithium carbonate smelting and processing business. Its annual production of 50,000 tons of lithium carbonate construction will be implemented in two phases, each with an annual output of 25,000 tons. At present, the first phase of construction has been put into trial production, and the second phase of construction is scheduled to start in May 2025."[223] **Tianli Lithium Energy Group Co., Ltd.** (天力锂能集团股份有限公司) announced that it had an agreement with Qaghiliq County (Ch: Yecheng) to invest 6 billion yuan to build a 5 million ton lithium ore mining project, a 30,000 ton lithium salt production project, and a 100,000 ton lithium battery materials project in the area.[224] **Xinjiang Chifeng Energy Technology Development Co., Ltd.** (新疆驰峰能源科技发展有限公司) announced a nearly 2 billion yuan investment in the first phase of a lithium carbonate project in XPCC-run Huyanghe Economic and Technological Development Zone.[225] Further signals of the XUAR government's intent to expand the lithium industry include logistics infrastructure for facilitating the transport of raw materials necessary for processing lithium.[226] (Notably, Ganfeng Lithium, China's leading lithium company, announced in 2023 that its joint venture in the XUAR had never been put into operation. An industry insider suggested that it had been a shell company.[227])

Downstream manufacturing of lithium-based products is also expanding rapidly in the region. The "Three-Year Action Plan for the Development of Lithium Battery New Energy Industry in Kashgar Region (2023–2025)," identified five key industrial clusters for lithium development: lithium resource development, the consumer battery assembly, electric vehicle battery manufacturing, energy storage battery manufacturing, and new energy vehicle assembly and manufacturing. Under the plan, downstream production relies on lithium mineral resources from the Uyghur Region, as well as Ngari Prefecture (Ch: Ali) in Tibet.[228] Industrial planning has concentrated the battery manufacturing industry in the Kashgar Region.[229]

In 2023, researchers at Sheffield Hallam conducted extensive research and constructed a map of lithium supply chain flows in the XUAR automotive sector.[230] While this chapter seeks to update the researchers' findings, it does not seek to repeat them.

Xinjiang Zhicun New Energy Materials Co., Ltd. (新疆志存锂业有限公司)

Zhicun Lithium Industry Group Co., Ltd. (志存锂业集团有限公司) put its subsidiary **Xinjiang Zhicun New Energy Materials Co., Ltd.** (新疆志存锂业有限公司) into operation in 2022.[245] Xinjiang Zhicun Lithium Co., Ltd. has in turn invested in and constructed three lithium carbonate production projects in Bayingholin, Hotan, and Altay in the XUAR.[246]

In 2023, Xinjiang Zhicun completed the first phase of its project in Chaqiliq County (Ch: Ruoqiang) in Bayingholin, establishing 60,000 tons/year lithium carbonate production capacity.[247] The company claims it will have the largest production capacity of lithium carbonate for single-cell batteries in China, and the completed project will reach an "annual output of more than 120,000 tons, achieve sales revenue of more than 30 billion yuan, and create employment for more than 1,500 people."[248] However, the company is far from hitting these projections.[249]

Zhicun Lithium Group operates a joint venture with Xinjiang Nonferrous and the Hotan government, **Lop Zhicun New Energy Materials Co., Ltd.** (洛浦志存新能源材料有限公司), as Zhicun Lithium's "Hotan Base." Lop Zhicun is responsible for the planned 30,000-ton lithium carbonate project in the Nonferrous Metals Industrial Park of the Kungang Economic and Technological Development Zone.[250]

In 2024, Xinjiang Zhicun accounted for more than 60% of the Uyghur Region's lithium production.[251]

Since 2022 when the company was established, Xinjiang Zhicun has started at least 17 subsidiaries in the XUAR, totalling nearly 2.9 billion RMB in investments, ranging from mining to manufacturing to logistics (see Table 4). The company clearly anticipates making Xinjiang a major part of its value chain.

PARTICIPATION IN LABOUR TRANSFERS

As Xinjiang Zhicun's investments in the Uyghur Region have expanded, so too has its demand for labour. Xinjiang Zhicun and its subsidiaries recruit workers through the region's labour transfer program and through state-sponsored "job fairs."

In 2022, Xinjiang Zhicun participated in a job fair organised by Chaqiliq (Ch: Ruoqiang) County, aimed at "promoting the transfer of surplus urban and rural labour to local and nearby employment."[252] The same year, Xinjiang Zhicun organised an on-site job fair in Toghraq Eghil (Ch: Tuogelake Aigele) Village in Cherchen (Ch: Qiemo) County, where the company "made every effort to promote the employment of surplus rural labour." One of the resulting hires, Mengnisaxan Turdi, makes clear the role of the State: "We are grateful to the Party and the government for providing us with so many job opportunities."[253] Online recruitment in 2022 emphasised military veterans, and included a job posting for 20 "security personnel," responsible for discipline management, regular personnel assessments, 24-hour patrol, and semi-military training. Among the job requirements is to "implement militarised management, unified command and unified deployment."[254]

In March 2023, Lop Zhicun recruited local villagers at a job fair organised, in part, by a local government Rural Revitalization Office. The article indicates that Xinjiang Zhicun subsidiary Lop Zhicun aimed to recruit more than 500 workers from a state-sponsored job fair for graduates of Hotan Normal College.[255] In June 2023, the Bugur (Ch: Luntai) County Party Committee held a state-sponsored recruitment event featuring only Xinjiang Zhicun, with the aim to "promote employment of surplus rural labour." Among the attendees was Rabigul Yasin, a recent graduate from Baghboyi (Ch: Bageboyi) Village, who was also quoted as saying, "I am grateful to the Party and the government for providing us with so many job opportunities."[256]

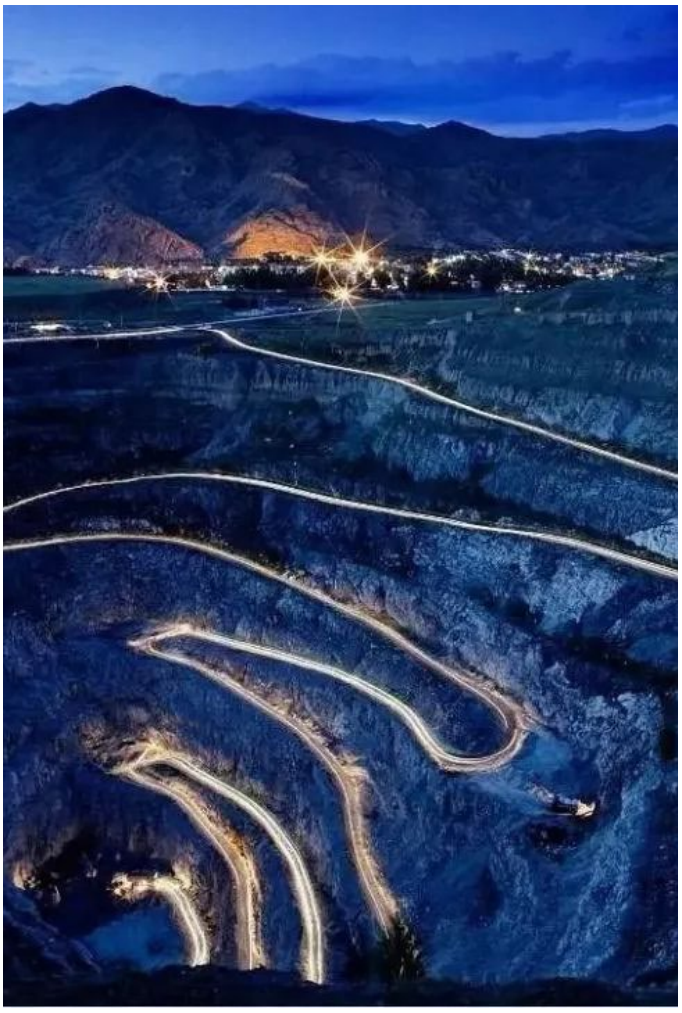


Figure 7: Keketuohai Mine No. 3, where Xinjiang Nonferrous mined lithium and beryllium for decades. Source: The Paper.

TABLE 4. XINJIANG ZHICUN LITHIUM INVESTMENTS IN THE XUAR SINCE 2022 [257]

NAME	OWNERSHIP	ESTABLISHED DATE	REGISTERED CAPITAL
Altay Zhicun New Materials Co., Ltd (阿勒泰地区志存新材料有限责任公司)[258]	100%	2023-02-19	RMB 100 million
Bazhou Zhicun Smart Energy Co., Ltd. (巴州志存智慧能源有限公司)[259]	100%	2023-07-23	RMB 20 million
Pishan County Karakorum Mining Co., Ltd. (皮山县喀喇昆仑矿业有限公司)[260]	100%	2023-03-30	RMB 100 million
Bazhou Xiyu Loulan New Energy Materials Co., Ltd. (巴州西域楼兰新能源材料有限公司)[261]	100%	2023-03-29	RMB 500 million
Fuyun County Zhicun New Materials Co., Ltd. (富蕴县志存新材料有限责任公司)[262]	100%	2023-02-04	RMB 100 million
Hotan Zhicun New Materials Co., Ltd. (和田志存新材料有限公司)[263]	100%	2022-12-23	RMB 100 million
Lop Zhicun New Energy Materials Co., Ltd. (洛浦志存新能源材料有限公司)[264]	100%	2022-12-23	RMB 500 million
Xinjiang Qiang Electric Energy Investment Co., Ltd. (新疆羌电能源投资有限公司)[265]	100%	2022-09-01	RMB 5 million
Xinjiang Zhicun Supply Chain Management Co., Ltd. (新疆志存供应链管理有限公司)[266]	100%	2022-07-24	RMB 100 million
Qiemo Zhicun New Materials Co., Ltd. (且末志存新材料有限公司)[267]	100%	2022-07-09	RMB 100 million
Xinjiang Zhicun Smart Energy Co., Ltd. (新疆志存智慧能源有限公司)[268]	100%	2022-05-24	RMB 10 million
Ruoqiang Zhicun New Materials Co., Ltd. (若羌志存新材料有限公司)[269]	100%	2022-02-07	RMB 10 million
Xinjiang Zhicun Jinqian New Energy Materials Co., Ltd. (新疆志存金乾新能源材料有限公司)[270]	84%	2023-01-12	RMB 100 million
Xinjiang Zhicun New Energy Materials Co., Ltd. (新疆志存新能源材料有限公司)[271]	84 %	2022-02-14	RMB 100 million
Xinjiang Zhicun Boyuan New Energy Materials Co., Ltd. (新疆志存博远新能源材料有限公司)[272]	82%	2023-02-15	RMB 500 million
Xinjiang Zhicun Gaoyuan Mining Co., Ltd. (新疆志存高远矿业有限公司)[273]	51%	2022-08-22	RMB 100 million
Zhongbo New Energy Technology (Xinjiang) Co., Ltd. (中博新能源科技（新疆）有限责任公司)[274]	25%	2023-07-20	RMB 400 million

Xinjiang Nonferrous Metal Industry (Group) Co., Ltd. (新疆有色金属工业（集团）有限责任公司) / Xinjiang Asia-Europe Rare Metal Co., Ltd. (新疆亚欧稀有金属股份有限公司)

Xinjiang Nonferrous Metal Industry Group Co., Ltd. (新疆有色金属工业（集团）有限责任公司) holds exploration and mining rights in two XUAR areas: Koktoqay and Dahongliutan.[275] The company lists lithium concentrate among its main products and claims "the concentrator processes 750 tons of raw ore per day and produces 5,000 tons of lithium concentrate (5%) per year" through at least August 2025.[276]

The Group operates the lithium processing industry through its wholly owned subsidiary, **Xinjiang Asia-Europe Rare Metal Co., Ltd.** (新疆亚欧稀有金属股份有限公司), and sub-subsidiary, **Urumchi Asia-Europe Rare Metal Co.** (乌鲁木齐市亚欧稀有金属有限责任公司).[277] Corporate documents indicate Asia-Europe Rare Metal is the PRC's second largest producer of lithium metal.[278]

Xinjiang Nonferrous transferred mining rights to its subsidiary **Xinjiang Kunlun Blue Diamond Co., Ltd.** (新疆昆仑蓝钻矿业开发有限责任公司) to manage the exploration and development of the Dahongliutan area.[279] Based on the hard-rock lithium resources of the Dahongliutan area, the region is expected to become the PRC's "next lithium resource base."[280] The Dahongliutan mine is specifically identified as key construction project in the XUAR's "14th Five-Year Plan."[281] On February 28, 2025, Xinjiang Nonferrous announced it had completed "the first batch of spodumene concentrate products [which] met the standards after testing" of the Dahongliutan mine and proclaimed its "key project of Xinjiang's '14th Five-Year Plan' has officially entered the full trial production stage."[282]

PARTICIPATION IN LABOUR TRANSFERS

Xinjiang Nonferrous's participation in the PRC's state-imposed labour transfer programs has been documented in media and academic reporting over the last several years. In November 2024, the United States government concluded that Xinjiang Nonferrous "work[s] with the government of Xinjiang to recruit, transfer, or receive workers, including Uyghurs, out of Xinjiang," including Hotan and Kashgar prefectures. The U.S. found sufficient evidence for the addition of Xinjiang Nonferrous to the UFLPA Entity List.[283] Xinjiang Nonferrous has been the subject of investigations that identified that the conglomerate and its subsidiaries engage in state-sponsored labour transfer programs.[284]

SDIC Xinjiang Lithium Co, Ltd. (国投新疆锂业有限公司)

SDIC Xinjiang Lithium Co, Ltd. (国投新疆锂业有限公司) is a subsidiary of the state-owned enterprise **SDIC Xinjiang Luobupo Potash Co., Ltd.** (国投新疆罗布泊钾盐有限责任公司).[285] State media identified SDIC Luobupo Potash as the world's largest potassium sulphate production base, credited with a 45% domestic market share.286 SDIC Luobupo Potash is located in the "military restricted area of Lop Nur [Ch: Luobupo] Salt Lake and Malan Military Base in Chaqiliq County, Bayingholin Mongolian Autonomous Prefecture."[287]

SDIC Xinjiang Lithium was established to manage the Lop Nur Salt Lake Lithium Extraction (5,000 tons/year) Project, designed to utilise the "old" brine produced by SDIC Luobupo Potash's potash fertiliser processing as raw material for lithium brine extraction, intrinsically linking the two entities' supply chains.[288] The project entered into the trial production stage in December 2023, and reached full production in 2024.[289] By December 2024, the company reported a total output of 5,571.5 tons of lithium carbonate equivalent (LCE), making it one of the only lithium projects in the Uyghur Region to report actual lithium carbonate production in 2024.[290]

Even though SDIC is a newcomer in the XUAR lithium sector, in 2024, the company's production constituted more than 30% of the region's lithium production.[291]

PARTICIPATION IN LABOUR TRANSFERS

Through its parent company, SDIC Xinjiang Luobupo, lithium produced by SDIC Lithium may be at an elevated risk of engagement in the poverty alleviation and labour transfer programs imposed in the Uyghur Region. Since at least 2016, SDIC Luobupo Potash has actively participated in the government's repressive "poverty alleviation" and "rural revitalization" schemes, including through state-sponsored labour transfers.[292] One state media report describes how in 2016, the company "received 30 young people from southern Xinjiang and placed them in Hami Vocational and Technical College to receive secondary vocational and technical education. After graduation, all of them were incorporated into the company's employment system and are now employed in the company's front-line production positions."[293]

According to an article in 2017, SDIC Luobupo Potash remained active in the region's "poverty alleviation" and "mutual assistance" programs, and reportedly "organised and created the 'Internal and External Interconnection, Pairing and Mutual Assistance' activity project, provided jobs in batches to ethnic minority youths stationed in the company's poverty alleviation villages, carried out hands-on safety education and learning training, and enhanced national unity."[294] A 2021 report shows the company continuing its extensive poverty alleviation activities, including its "employment poverty alleviation" program using the "rural workshop + industrial worker model."[295]

In 2023, SDIC Xinjiang Luobupo Potash was designated an "Autonomous Region Ethnic Unity and Progress Demonstration Enterprise."[296] As recently as June 2023, SDIC Xinjiang Luobupo Potash, the parent company of SDIC Xinjiang Lithium, has actively participated in "ideological poverty alleviation."[297]

Downstream Supply Chain Risk (All XUAR Lithium)

The development of the lithium industry in the XUAR has been accompanied by an explosion in the manufacturing of lithium-based batteries and related products in the last three years. While the lithium industry in the XUAR is still in its early stages, it is reasonable to believe that lithium battery companies operating in the region likely source (or anticipate sourcing from) the expanded lithium mining and processing in the Uyghur Region. The entities identified in this chapter represent only a fraction of the companies that are expanding into the Uyghur Region to take advantage of the growing lithium and lithium battery industries.

Development of the Kashgar Economic Development Zone as "China's Western Lithium Battery Capital" has spurred significant recent corporate investment.[298] Taiwanese market research group TrendForce reported that, since 2022, the Kashgar Economic Development Zone has "successfully attracted more than 30 lithium battery-related companies to settle in. The products of these companies cover many fields, such as negative electrode materials, battery separators, electrolytes, battery structures, 3C digital batteries, vehicle batteries and energy storage batteries. At present, the number of lithium battery projects in the Kashgar Economic Development Zone has accounted for more than 70% of the whole of Xinjiang, making it the largest lithium battery industry processing base in Xinjiang."[299]

Companies from around China, including **Dongguan Duniao Electronic Technology Co., Ltd.** (东莞市钝鸟电子科技有限公司), **Henan Smart New Energy Co., Ltd**. (河南省斯马特新能源有限公司), **Shanxi Jutai New Energy Technology Co., Ltd.** (山西炬泰新能源科技有限公司), and **Xinjiang Chenhe New Energy Technology Co., Ltd.** (新疆晨禾新能源科技有限公司), have begun operating in the Kashgar park. The Kashgar Economic Development Zone is also the site of the production of 120 million consumer digital batteries by **Huali Lithium Energy Technology Co., Ltd.** (华力锂能源科技有限公司) and the anticipated production of 100 million consumer digital batteries by Chenhe New Energy Technology Co., Ltd.[300]

Kashgar Ande Optoelectronics Technology Co., Ltd. (喀什安德光电科技有限公司) manufactures lithium-ion batteries and solar energy-saving products in the Kashgar Economic Development Zone. In 2023, the Xinjiang Daily reported that the company's annual imports and exports totalled US$28.62 million, including to Russia, and the company is actively working to expand its markets in Central Asia, Europe, and Russia.[301] In 2021, Kashgar Ande Optoelectronics served as an "enterprise representative" from the Kashgar Economic Development Zone for a symposium on "Labor Creates a Good Life," an effort to refute "the lies and fallacies of so-called 'forced labour' in Xinjiang fabricated by anti-China forces in the United States and the West."[302]

Figure 8: Birds-eye view of the 4 million ton/year ore dressing workshop of the Dahongliutan project. Photo by Shi Xin. Source: Xinjiang Daily.

Xinjiang Jiujiang New Energy Technology Co., Ltd. (新疆九疆新能源科技有限公司) is a lithium battery manufacturer also located in the Kashgar Economic Development Zone. As of 2023, the company's daily lithium battery production reached 300,000 units, destined for assembly into consumer electronics including for smartphones, tablets, and power tools.[303]

Hunan Zhongdeng Energy Co., Ltd. (湖南中嶝能源有限公司) is expanding its investment in the Uyghur Region, particularly in the lithium-titanium battery space. In 2024, Zhongdeng Energy began construction of a 0.5 GWh annual titanium-lithium high-energy vehicle battery and energy storage container project in the Kashgar Economic Development Zone. The company also entered into a 600 million yuan investment agreement with the Hotan County government for a 1 GWh titanium-lithium high-energy vehicle battery production project, which was set to begin construction in July 2024. The company is also actively negotiating investment cooperation with other prefectures, counties, and cities in Xinjiang.[304]

In another part of Kashgar, **Jiangte Special Electric Co., Ltd.** (江特电机公司), a subsidiary of **Jiangte Motor** (江西特种电机股份有限公司, also known as Jiangxi Special Motor Co., Ltd.),[305] signed a cooperation framework agreement with Qaghiliq County via its subsidiary to invest 10 billion yuan in three years to implement three projects: 5 million tons of lithium ore mining, 50,000 tons of lithium salt production, and 200,000 tons of positive electrode materials.[306] Jiangte Motor's 2024 investment agreement with Qaghiliq County provides that the government will ensure that the company's lithium resource needs are met any time there is a "resource gap" for the company's lithium salt production,[307] which presumably suggests that the government will in some way support the company materially. Jiangte Motor established three XUAR subsidiaries for its lithium-based operations in the Uyghur Region: **Xinjiang Jianglun New Energy Co., Ltd.** (新疆江仑新能源有限公司), **Xinjiang Jiangte Energy & Metals Co., Ltd.** (新疆江特能源金属有限公司), and **Xinjiang Jiangte Energy Mining Co., Ltd.** (新疆江特能源矿业有限公司).[308] Jiangte Motor is a vertically integrated company that specialises in lithium mining and motor production.[309] Before its expansion into the Uyghur Region, the company's primary lithium extraction region was lithium-rich Yichun, Jiangxi Province.[310] The company manufactures a wide range of lithium batteries, for automotive, wind energy, and industrial uses; it also makes servomotors that are used in robotics and other specialised precision applications.[311] Jiangxi Jiangte Electric Vehicle Co., Ltd. shipped electric scooters weighing nearly 20,000kg to the Mexican company **Vida Care Tecnologia En Salud** in 2024.[312]

4
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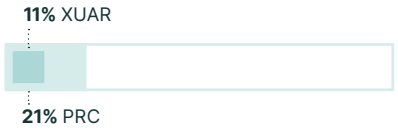
9.012

Beryllium 铍

BERYLLIUM:

Global Production Share

MINED



The world's beryllium supply chain is concentrated among only a handful of countries. In 2024, the United States remained the world's leading producer of beryllium ore, accounting for roughly half of global mine production.[313] The PRC accounted for approximately 21%.[314] Approximately **83.5% of China's beryl reserves are located in the Uyghur Region** and Xinjiang is the top source of beryllium in the country, accounting for over **50% of domestic beryllium supply**.[315] Beryllium is both lightweight and stiff, making it an important application in the aerospace and defence industries. Beryllium-copper alloys are highly conductive, and thus they are used in a wide range of electrical applications, as well as in the aerospace and telecommunications sectors.[316]

Beryllium is designated in the PRC as a national "strategic mineral."[317] State and regional policy incentives designed to expand the production of beryllium in the Uyghur Region include tax benefits, financial subsidies, and operational support, including a reduced corporate income tax rate as a feature of the PRC's "Encouraged Industries in the Western Region" provisions.[318]

State-owned and U.S.-sanctioned Xinjiang Nonferrous Group controls the extraction, production and processing of beryllium in the Uyghur Region, as documented below.

Anticipated Growth

Regional and local government programs are facilitating the expansion of beryllium production in the Uyghur Region, including the designation of Hotan's Dahongliutan lithium-beryllium mine in the XUAR government's "Master Minerals Plan (2021–2025)" as a development priority.[319]

Additional identified beryllium reserves in the region may further expand Xinjiang Nonferrous Group's position over global supply. Beryllium and lithium are often located in the same mines. Xinjiang Nonferrous Group currently holds exploration rights for two lithium-beryllium deposits in Hotan (Ch: Hetian) and Chaqiliq Ch: Ruoqiang) counties in the XUAR.[320] Xinjiang Nonferrous is also seeking to expand its beryllium resources in the region through the Xinjiang Qobugsar (Ch: Hefeng) Uranium Beryllium Mine, which could provide 10,000 tons of beryllium metal.[321]

Figure 9: Beryllium-copper alloy production in Hengsheng Beryllium workshop.
Source: China Nonferrous Metals News.

Supply Chain

UPSTREAM:

Beryllium production depends on two mineral feedstocks: bertrandite, which is mined in the United States and accounts for roughly half the world's mine production, and beryl, which is primarily mined in Brazil, China and Mozambique and represents the remaining 50%.[322]

MIDSTREAM:

Beryllium ore is processed through crushing or melting, followed by chemical treatment to produce beryl hydroxide, which is further refined into beryllium oxide.[323] Beryllium oxide is used to produce beryllium copper alloys, the most common beryllium product.[324]

DOWNSTREAM:

Beryllium oxide is vital for the ceramics and nuclear sectors. Beryllium foil is used in X-ray lithography. Beryllium-copper alloys are key in electronics, telecommunications, and high-performance components like springs, windshields, and structural parts for aircraft and spacecraft.[325]

Supply Risk

DEMAND:

Beryllium demand is driven by advanced applications in aerospace, defence, electronics, communications, and nuclear technologies.[326]

RELIANCE:

Beryllium is designated a critical or strategic mineral in at least five countries and the EU,[327] and as a "defence-critical raw material" by NATO.[328] Global supply is heavily reliant on only a few countries and suppliers for upstream production; for instance, beryllium is among only three U.S. critical minerals identified under the "single point of failure" criteria, under which a mineral qualifies as critical where only one domestic producer exists.[329]

RESILIENCE:

Global beryllium supply is highly vulnerable to shock due to geographic and ownership concentration,[330] and extreme health and environmental risks.[331] U.S. beryllium apparent consumption fell 20% from 2022 to 2023, due, in part, to a 36% reduction in beryllium imports, largely from Kazakhstan,[332] which may have resulted from an increase in Kazakh and PRC trade during that period.[333]

SUBSTITUTABILITY:

Beryllium is resource-intensive to extract, process and access, resulting in high prices. The high cost means that applications are largely limited to those that rely on properties specific to beryllium.[334] Limited substitutes for beryllium for certain technologies exist; however, current substitutes result in a loss of performance and similar cost burdens for most end uses.[335]

Xinjiang Nonferrous Metals Industry Group Co., Ltd. (新疆有色金属工业（集团）有限责任公司) / Fuyun Hengsheng Beryllium Industry Co., Ltd. (富蕴恒盛铍业有限公司)

China's second largest beryllium enterprise is the massive state-owned mining conglomerate **Xinjiang Nonferrous Metals Industry Group Co., Ltd.** (新疆有色金属工业（集团）有限责任公司).[336] **Fuyun Hengsheng Beryllium Industry Co., Ltd.** (富蕴恒盛铍业有限责任公司) operates the conglomerate's beryllium business.[337] Fuyun Hengsheng was acquired by Xinjiang Nonferrous's publicly listed subsidiary **Western Gold Co., Ltd.** (西部黄金股份有限公司) in 2023.[338] Fuyun Hengsheng's registered address is the Kalatongke Copper-Nickel Mine in in the XUAR,[339] and it operates its downstream beryllium smelting and processing facilities in Heilongjiang Koktoqay (Ch: Fuyun) Industrial Park (黑龙江富蕴工业园区), which is also located in the XUAR.[340]

Fuyun Hengsheng's primary products are beryllium oxide and beryllium-copper alloy. The company boasts an end-to-end domestic beryllium industrial chain, including exploration, mining, mineral processing, smelting and sales.[341] As of 2024, Xinjiang Nonferrous held the mining rights for beryllium and lithium extraction from two mines: Dahongliutan 509 Mine Daobanxi Area 1 Lithium-Beryllium Polymetallic Mine (大红柳滩 509 道班西一区锂铍多金属矿) and Koktoqay County Keketuohai No. 1 Mine (富蕴县可可托海一矿).[342] Xinjiang Nonferrous maintained its annual production capacity of 3,000–4,000 tons of beryllium concentrate through at least 2024, reflecting the stable raw material supply flow to Fuyun Hengsheng.[343] Company reports indicate Hengsheng Beryllium's production capacity continues to expand, particularly due to technological advancements in ore separation and recovery related to slag and tailings. In 2022, Xinjiang Nonferrous claimed a capacity of 100 tons of industrial beryllium oxide, 800 tons of beryllium copper alloy and 20 tons of nuclear-grade beryllium fluoride.[344] In 2024, Hengsheng's beryllium-copper alloy production totalled 908.16 tons, a production increase of 23.66% over the previous year.[345]

In late 2023, Xinjiang Nonferrous announced: "In the new era, Hengsheng Beryllium Industry will take over the baton from the older generation of revolutionary martyrs, continue the spirit of Keketuohai, inherit the red gene of winning glory for the country, assume the mission of making important contributions to our country's 'two bombs and one satellite' programs, national defence construction, and repayment of national debt since the 1950s, and continue to make greater contributions to the national defence cause."[346]

PARTICIPATION IN LABOUR TRANSFERS

In November 2024, the U.S. government concluded that Xinjiang Nonferrous and Western Gold, including its subsidiaries Western Gold Qaramay (Ch: Karamay) Hatu Gold Mine and Western Gold Qumul Gold Mine, work with the government of the XUAR to recruit, transfer, or receive workers, including Uyghurs, out of the region. The U.S. found sufficient evidence for addition of these entities to the UFLPA Entity List.[347] Previous reporting by C4ADS identified evidence from annual company reports indicating Western Gold's participation in the region's state labour transfer program.[348] Similarly Xinjiang Nonferrous has been the subject of investigations that identified that the conglomerate and its subsidiaries engage in state labour transfer programs.[349] Even as recently as its 2023 Annual Report, Western Gold detailed the company's ongoing participation in poverty alleviation and rural revitalisation programs in the Uyghur Region, including its commitment to

recruiting local minority employees and interns to contribute to "poverty alleviation through employment."[350]

There is significant evidence to show that the Xinjiang Nonferrous/Western Gold subsidiary that is responsible for the conglomerate's beryllium production is also involved in the XUAR's labour transfer programs. In 2017, Fuyun Hengsheng participated in state labour transfers as part of the local government's poverty alleviation efforts. State media describes a local employment platform that facilitated the transfer of "72 labourers to copper-nickel mines, Hengsheng Beryllium Industry, brickyards, and town construction sites, of which 23 became industrial workers."[351]

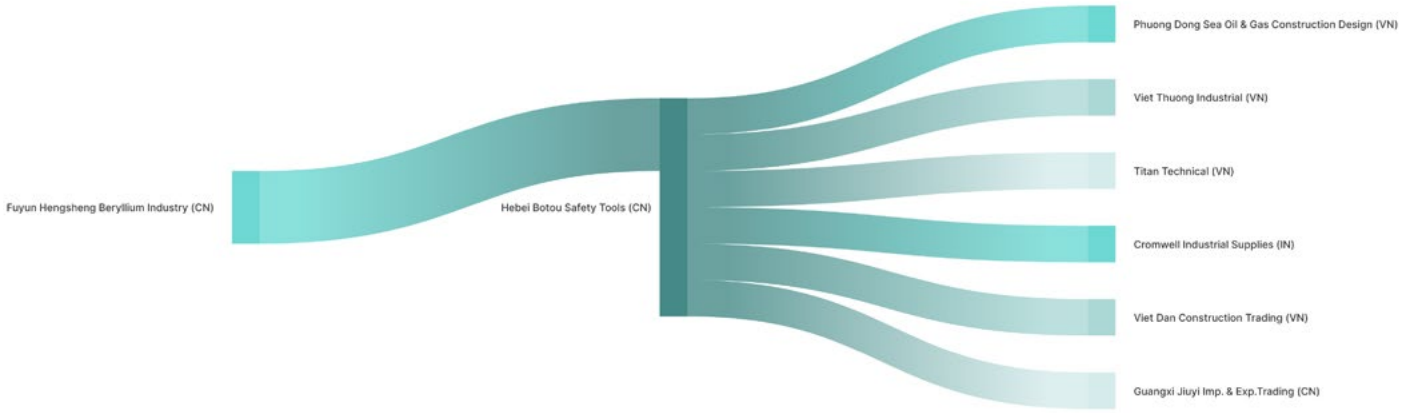
In 2022, workers at Fuyun Hengsheng were placed under emergency quarantine, forcing workers to remain under lockdown at the factory. According to state media, "Colleagues who have been under lockdown in the factory...have endured a dearth of food and clean clothing for 10 days." Workers brought in for "shift change" were delivered to the factory by people in full PPE and police cars, without knowing when they would return home. While "[t]here was no adequate preparation, no maintenance team, no laboratory control sample data... necessary conditions for production," factory production continued,[352] leaving the company's Uyghur workers—ostensibly including those subjected to labour transfers—vulnerable while others were locked down to prevent contraction of COVID.

There is evidence that the labour transfers to Fuyun Hengsheng continued even after the pandemic. According to 2022 marketing materials, "tens of thousands of rural labourers" received training from the Altay Regional Vocational and Technical School to be "completely transferred to various industries developing in the regional economy." Students and graduates of the Altay school have been transferred to various state-owned mining enterprises, including Fuyun Hengsheng, as well as Ashele Copper Mine and Jinshan Mining and Metallurgy.[353]

DOWNSTREAM SUPPLY CHAIN RISK

Although the PRC is heavily import-dependent for its domestic beryllium consumption,[354] Fuyun Hengsheng's XUAR-produced beryllium enters global markets through downstream distributors and as inputs in downstream products. According to Xinjiang Nonferrous Group's corporate documents, Fuyun Hengsheng Beryllium Industry's products are primarily sold to enterprises in Jiangsu and Zhejiang.[355] Due to the geographic concentration of commercially viable beryllium reserves, the party-state's monopoly over processing capacity, and inherently opaque supply chains, **all products containing beryllium inputs from the PRC are at high risk of exposure to the Uyghur Region**.

Fuyun Hengsheng's publicly identified customers include the **Chinese Academy of Sciences** (中科院) and the **Chinese Academy of Engineering Physics** (绵阳九院).[356]



Fuyun Hengsheng Beryllium Industry downstream supply chain risk.

In 2023, **Hebei Botou Safety Tools Co., Ltd.** (河北中泊防爆工具集团股份有限公司, also known as Hebei Zhongbo Explosion-Proof Tools Group Co., Ltd.)[357] listed Fuyun Hengsheng as its fourth largest supplier.[358] Botou Safety Tools is highly specialised in the production of beryllium-copper alloy explosion-proof tools.[359] Shipping records indicate Hebei Botou Safety Tools has exported tools made with beryllium to **Phuong Dong Sea Oil & Gas Construction Design Jsc** (VN), **Viet Thuong Industrial Co., Ltd.** (VN), **Titan Technical Jsc** (VN), **Cromwell Industrial Supplies Private, Ltd.** (IN), and **Viet Dan Construction Trading Co.** (VN) over the past two years. Beryllium-copper tools manufactured by Botou Safety Tools are also exported from China through other trading and downstream companies. **Guangxi Jiuyi Import & Export Trading Co., Ltd.** (CN) for instance, shipped beryllium-copper tools manufactured by Hebei Zhongbo Explosion Proof Tools Group Co. Ltd. to **Cuong Phat Mechanical Trading Co., Ltd.** (VN) in Vietnam in 2024. The company ships a variety of tools internationally, but shipping records are insufficient to determine whether those tools include beryllium inputs.[360]

According to corporate reports, industry publications and

state media, Fuyun Hengsheng is the only domestic producer of nuclear-grade beryllium fluoride—and the sole supplier for the PRC's "fourth-generation nuclear energy thorium-based molten salt reactor project."[361] In 2023, China State Shipbuilding Corporation "unveiled plans for a nuclear-powered container ship expected to be the largest ever built," set to feature "a thorium-based Generation IV molten salt reactor."[362] Consequently, beryllium mined and produced in the Uyghur Region will not only expose global supply chains through the distribution of beryllium-based products, but could power the maritime instruments of the global supply chain itself.

Figure 10: During the closed factory period, the company's various processes were operating normally, and the beryllium oxide workshop's smelting process was discharging materials. Photo by Li Xiaohu. Source: Weixin, Xinjiang Nonferrous Metals.

12
Mg
24.305

Magnesium 镁

According to the China Nonferrous Metals Industry Association, the PRC leads the world in raw magnesium production at 92%, a 10% increase over the country's portion of the world's production in 2023.[363] As of 2025, the United States Geological Survey estimates 95% of the world's magnesium smelting production is in China.[364] The PRC's magnesium industry is heavily concentrated in Shaanxi and Shanxi,[365] but the XUAR appears to be one of only four province-level jurisdictions that produce raw magnesium in any reportable quantity.[366]

The XUAR accounted for about 5.6% of China's smelted magnesium production in 2024 (more than 5% of the global total); the region's magnesium output more than doubled over the previous year.[367] Furthermore, as this report will show, there appears to be investment in expanding the magnesium industry in the last year, including in the downstream smelting and manufacturing segments of the industry, and a significant expansion in magnesium ingot production, which is used aluminium alloys.

Anticipated Growth

In February 2024, the Qumul Municipal Government issued a policy for the development of industrial development clusters, including magnesium-based industries.[368]

In February 2025, **Xinjiang Jinsheng Magnesium Industry Co., Ltd.** (discussed below) announced that due to market demand, the company would accelerate the development of its new 35,000-ton magnesium and magnesium alloy plant.[369]

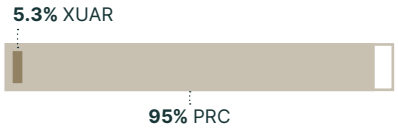
In March of 2025, **Xinjiang Zhonghe** (also known as Xinjiang Joinworld, discussed below) announced that it had set up a wholly owned subsidiary, **Xinjiang Hongxing Magnesium Industry Co., Ltd**. (新疆红星镁业有限公司,sometimes translated as Xinjiang Red Star)focused on magnesium casting, manufacturing, and alloy production.[370]

Figure 11: Workers in the reduction furnace production workshop of Xinjiang Hami Shengmei Magnesium Industry Co., Ltd., one of the "key enterprises" in the 13th Division of the Xinjiang Production and Construction Corps. Source: Banchao Group, the 13th Division Media Integration Center.

MAGNESIUM:

Global Production Share

SMELTED



Supply Chain

UPSTREAM:

Magnesium resources are widespread and extracted from multiple sources including dolomite ores, seawater, and magnesium-rich brines.[371]

MIDSTREAM:

Magnesium metal production in the PRC is generally performed via the Pidgeon process, an energy- and labour-intensive process with significant environmental risks.[372] Approximately 70% of global magnesium production is used to make alloys (including aluminium alloys).[373]

DOWNSTREAM:

Magnesium alloys are used to make components and semi-finished products (usually through die-casting) for the automotive, transportation, aerospace and electronics industries. Magnesium is widely used in packaging, pharmaceutical, agricultural, and other industries.[374] Automotive demand for light-weight magnesium alloys is significant.[375]

Supply Risk

DEMAND:

Magnesium demand is driven by the light-weighting of vehicles using magnesium alloys as well as the incorporation of magnesium into high-strength steel.[376] In the short-term, global magnesium supply is sufficient to meet demand for the highest calculations of projected demand.[377]

RELIANCE:

As of 2025, five major economies and the EU had listed magnesium as a critical or strategic mineral.[378] While estimated global reserves are nearly infinite, 2024 estimates show the PRC controls the majority of upstream magnesium production, including 92% of raw magnesium production and 95% of smelting.[379]

RESILIENCE:

Magnesium supply chains are vulnerable to disruption due to geographic concentration in the PRC.[380] The magnesium supply chain is characterised by a broad resource distribution, but geographically concentrated mid- and down-stream production and processing in the PRC. Alternative sourcing is limited. Russia is the second largest producer of magnesium at 5%.[381]

SUBSTITUTABILITY:

Magnesium substitutes are limited, with lower performance capabilities and, for some alternatives, higher prices.[382]

Xinjiang Jinsheng Magnesium Co., Ltd. (新疆金盛镁业有限公司)

Xinjiang Jinsheng Magnesium Co., Ltd. (新疆金盛镁业有限公司) is a subsidiary of the **Wuchan Zhongda Group Co., Ltd.** (物产中大集团股份有限公司), an expansive state-owned enterprise headquartered in Zhejiang Province that is focused on steel, iron ore, and nonferrous metals.[383] Wuchan Zhongda Group boasts that it is one of China's "large-scale supply chain service integrators for bulk commodities."[384] The company is currently ranked 150th on the Fortune Global 500 list.[385] In 2023, via a wholly-owned subsidiary, Wuchan Zhongda Group acquired Zhejiang Qixin Alloy Materials Co., Ltd.,[386] the world's second largest raw magnesium producer and largest magnesium ingot supplier,[387] and renamed it **Wuchan Zhongda Qixin Alloy Materials Co., Ltd.** (物产中大柒鑫合金材料有限公司).[388] The company controls over 8% of China's raw magnesium market share.[389]

Despite the company's headquarters previously being in Zhejiang, the newly acquired Wuchan Zhongda Qixin has four major production bases, all of which are in China's "autonomous regions:" Inner Mongolia Jinshi Magnesium Co., Ltd., Ningxia Taiyang Magnesium Co., Ltd., Ningxia Ruixing Mining Co., Ltd., and **Xinjiang Jinsheng Magnesium Co., Ltd.** (新疆金盛镁业有限公司).[390]

Established in 2011, Xinjiang Jinsheng is located in the Southern Circular Economy Industrial Park of the Qumul High-tech Industrial Development Zone. Xinjiang Jinsheng produces, processes, and sells magnesium ingots, magnesium alloys, ferroalloys and other products.[391]

Wuchan Zhongda Group is a key participant in Zhejiang's "Xinjiang Aid" programs, paired with the Aksu government and the First Division of the Xinjiang Production and Construction Corps (XPCC). As of 2021, Wuchan Zhongda Group planned to build two industrial chains in the region based on Aksu's "rich underground oil resources and abundant above-ground cotton resources."[392]

PARTICIPATION IN LABOUR TRANSFERS

Xinjiang Jinsheng Magnesium has participated in the XUAR's poverty alleviation and labour transfer programs since at least 2016.[393] In 2017, the Chinese government designated the company as a "national employment poverty alleviation base" in the XUAR.[394] Xinjiang Jinsheng accepted state labour transfers of Uyghur people in 2018[395] and was featured in state propaganda for its participation in "poverty alleviation" programs and the transfer of rural workers.[396]

During the COVID-19 pandemic, Xinjiang Jinsheng's production facility remained operational due to the government's immediate transfer of rural labourers. On February 28, 2020, the Qumul (Ch: Hami) government responded to Xinjiang Jinsheng's labour shortage by organising labour "docking" with Rahetbagh (Ch: Huayuan) Township and Qaradowe (Ch: Wubao) Town. Within a few days, 52 labourers were delivered directly to Xinjiang Jinsheng by "point-to-point" transport, solving the company's labour shortage while "help[ing] the surplus labour force to achieve transfer and employment."[397] Xinjiang Jinsheng also features in the "happiness account book" of the Qumul Municipal Commission for Discipline Inspection and Supervision's "Visit, Benefit, Gather" work team of Bidilik Village.[398]

Xinjiang Jinsheng continues to be held out in State media as an example of the local government's successful transfers of rural and surplus labour. In 2023, Xinjiang Jinsheng was included in an article featuring enterprises that engaged in rural labour transfers.[399] In a 2023 article describing the Qumul

government's labour transfer program, Xinjiang Jinsheng is featured, and the article emphasizes that 60% of the company's employees are "local urban and rural labourers and college graduates."[400] As recently as March 2024, Xinjiang Jinsheng Magnesium worked with the government of Barköl (Ch: Balikun) to recruit eleven Kazakh farmers and herdsmen.[401]

DOWNSTREAM SUPPLY CHAIN RISK

Because Xinjiang Jinsheng is part of a massive commodities trading conglomerate that includes companies that represent the full industrial chain of metals processing, manufacturing, and distribution, there is notable risk of exposure to companies throughout the Wuchan Zhongda Group that use or sell magnesium and magnesium alloys.

An article describing Wuchan Zhongda Qixin's production bases, including Xinjiang Jinsheng, makes reference to the company's 2025 acquisition of **Shunfu Precision Technology Co., Ltd.,** a company that is engaged in aluminium alloy production (for which magnesium is often used).[402] An article published in 2025 announced that the company was going to focus on lightweight magnesium alloys in particular.[403] This suggests there may be a risk of exposure to XUAR sourcing and Xinjiang Jinsheng's labour transfer participation for products made by Shunfu Precision.

Xinjiang Tengxiang Magnesium Products Co., Ltd. (新疆腾翔镁制品有限公司)

Rare Earth Magnesium Technology Group Holdings Ltd. (稀镁科技集团控股有限公司) ("REMT Group") is an investment holding company controlled by **Century Sunshine Group Holdings Ltd.** (世纪阳光集团控股有限公司). REMT Group owns two subsidiaries in the Uyghur Region: **Xinjiang Rare Magnesium New Material Technology Co. Ltd.** (新疆稀镁新材料科技有限公司), and **Xinjiang Tengxiang Magnesium Products Co., Ltd.** (新疆腾翔镁制品有限公司), formerly known as Xinjiang Tengxiang Coal Chemical Co., Ltd. Tengxiang Magnesium is REMT Group's magnesium metal production base, located in the Southern Circular Economy Industrial Park of the Qumul High-Tech Industrial Development Zone.[404]

Despite having been added to the U.S. UFLPA Entity List,[405] REMT Group has remained publicly enthusiastic about its presence in the Uyghur Region. Its corporate website states that its Qumul production base will allow the Group to "ride on the express train of adapting to local conditions, its special economy, and circular economy, and make full use of the rich, high-quality and low-price coal and dolomite mineral resources and regional advantages in the Qumul region, which will provide good conditions and impetus for the Group to further develop the magnesium industry."[406]

PARTICIPATION IN LABOUR TRANSFERS

In 2021, a Kharon investigation identified Century Sunshine and REMT as the majority indirect owners of Xinjiang Tengxiang Magnesium and provided evidence suggesting that the XUAR-based entity "received transfers of impoverished labourers to 'transform farmers into industrial workers,' according to a 2018 local media report."[407] In 2022, Century Sunshine was identified in an investigation into the International Finance Corporation's (IFC's) investments in the Uyghur Region by the Helena Kennedy Centre for International Justice and NomoGaia. The report details Century Sunshine's investments, operations and sourcing activity in the Uyghur Region, including evidence of Century Sunshine's participation in the XUAR's state labour transfer program through Xinjiang Tengxiang.[408]

In August 2024, the U.S. Government announced the addition of Century Sunshine, REMT, and Tengxiang Magnesium to the UFLPA Entity List. The Government reached reasonable cause determinations for the addition of each entity based on specific evidence that: (1) Century Sunshine had "established its magnesium production base in the XUAR through its vertically-integrated subsidiaries, and sources magnesium from the XUAR"; (2) its subsidiary, Rare Earth Magnesium Technology Group Holdings, Ltd., "operates Century Sunshine Group Holdings, Ltd.'s magnesium product business, and sources magnesium from its magnesium production base located in the XUAR"; and, (3) Xinjiang Tengxiang Magnesium Products Co., Ltd., a subsidiary of Rare Earth Magnesium Technology Group Holdings, Ltd., "receives Uyghurs or members of other persecuted groups that the local Yizhou District government transfer from Xinjiang… [and] operates a magnesium production facility in the XUAR and sources raw materials from the XUAR, including coal and dolomite, to produce magnesium."[409]

Further evidence indicates participation in state-facilitated labour transfer or recruitment programs by REMT's subsidiaries. In 2021, state media reports indicated Tengxiang recruited Uyghur workers through a government-sponsored vocational training program.[410] According to REMT Group's 2023 ESG Report, Tengxiang Magnesium appears to hire "surplus labour" from the XUAR, and roughly 61% of its employees are residents of the Uyghur Region. Tengxiang Magnesium has received praise and "active support" from the local and regional governments, which "ensured the company's job employment needs."[411]

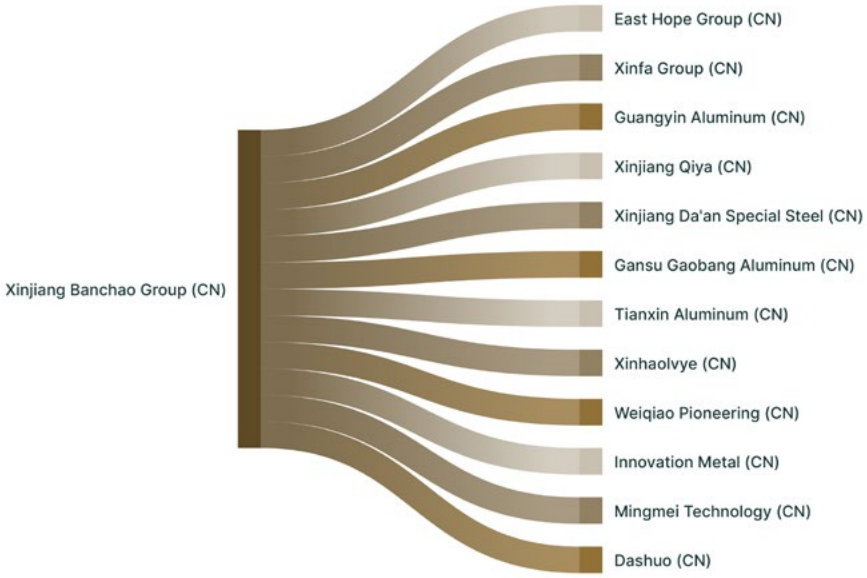
Xinjiang Banchao Group Co., Ltd. (新疆班超集团有限公司)

Xinjiang Banchao Group Co., Ltd. (新疆班超集团有限公司) is a privately-owned magnesium smelting and ingot producing company headquartered in Qumul, in an industrial zone controlled by the XPCC 13th Division.[412] Banchao Group's subsidiary, **Hami Shengmei Magnesium Industry Co., Ltd.** (哈密市盛镁镁业有限公司), is located in the Xinxing Economic and Technological Development Zone of the XPCC and makes magnesium products, including ingots.[413] In January 2022, Hami Shengmei Magnesium Co., Ltd. and Shaanxi's **Yanglaoda Group** (羊老大集团) jointly established **Xinjiang Banchao Magnesium Industry Co., Ltd.** (新疆班超镁业有限公司), another magnesium smelting and processing facility.[414]

DOWNSTREAM SUPPLY CHAIN RISK

In its corporate materials, Banchao Group lists Hami Shengmei's customers as some of the PRC's most important aluminium companies, **East Hope Group**, **Xinfa Group**, and **Guangyin Aluminium Co., Ltd.**[415] It also includes among its "partners" **Xinjiang Qiya**, **Xinjiang Da'an Special Steel**, **Gansu Gaobang Aluminium**, **Tianxin Aluminium**, **Xinhaolvye**, **Weiqiao Pioneering**, **Innovation Metal, Mingmei Technology**, and **Dashuo**.[416] The company also indicates that it exports its products to Europe and the United States.[417] Local reporting indicates Banchao Group began exporting to Italy in 2023—with plans to expand its export market in 2024.[418]

A 2022 state media report indicates that Hami Shengmei Magnesium sources dolomite and ferrosilicon from Gansu, smelts and processes it in the XUAR, and then ships magnesium ingots out to Hebei via the Hami Military-Civilian Integration Avenue.[419]



Xinjiang Banchao Group downstream supply chain risk.

Other Magnesium Sector Companies Operating in the XUAR

Xinjiang Zhonghe Co., Ltd. (新疆众和股份有限公司, also known as Xinjiang Joinworld) claims to be one of the top ten aluminium companies in China.[420] It has a joint venture with the First Geological Brigade of the Xinjiang Bureau of Geology and Mineral Resources for mining development, research, production and sales of magnesium products.[421] The joint venture, **Xinjiang Zhonghe Jinyuan Magnesium Co., Ltd.** (新疆众和金源镁业有限公司), was established in 2016, and in the same year, the company began construction of a magnesia industrial park in Pichan (Ch: Shanshan) County, which depends on the Wutonggou Magnesite Mine.[422] The company's main product is magnesium oxide.[423] In 2025, Xinjiang Zhonghe established a wholly-owned magnesium-related subsidiary, **Xinjiang Hongxing Magnesium Co., Ltd.** (新疆红星镁业有限公司), also translated as Xinjiang Red Star, which will focus on metal casting, manufacturing, and alloying.[424] Xinjiang Zhonghe Co., Ltd. was added to the UFLPA Entity List in November of 2024.[425]

Puyan Refractories Group Co., Ltd. (濮阳濮耐高温材料（集团）股份有限公司, "PRCO"), a Henan-based company focused on manufacturing of refractory products for the steel industry, acquired a majority stake in **Xinjiang Qinxiang Technology Co., Ltd.** (新疆秦翔科技有限公司) and its magnesite mining rights for **Xinjiang Hejing County Halehat Magnesite Mine** (新疆和静县哈勒哈特菱镁矿).[426] PRCO corporate reports confirm that, as recently as August 2024, the company's XUAR holding was one of three raw material bases (the others are in Qinghai and Tibet) for the company's upstream supply of magnesia for use in its "leading products."[427] The company makes aluminium magnesia carbon, and its corporate website indicates that it exports its products to the Americas, Europe, Southeast Asia, Africa, the Middle East, and elsewhere.[428]

Xinjiang Meite Magnesium Co. Ltd. (新疆美特镁业有限公司) operates the Tianhu No. 1 Dolomite Mine in Xingxingxia in Qumul.[429] In October of 2024, Xinjiang Meite revealed plans in an environmental report for a new production line that will produce 150,000 tons of magnesium alloy.[430]

Conclusions & Recommendations

For more than eight years, the world has witnessed crimes against humanity against Uyghur and other Turkic people of the Uyghur Region. Numerous reports have identified the means by which the PRC government has used state-imposed forced labour as a tool of repression in the region. Hundreds of companies operating in the region have been called to account for their participation in these programs. Hundreds more international companies have been identified as being directly downstream of the products made through coercive state labour transfer programs or at risk of being connected to them.

As knowledge of the human rights crisis in the Uyghur Region grows, many in the trade community have taken swift action to shift supply chains, diversify suppliers, and increase production in other parts of the world. Some governments have passed legislation to combat the import of forced-labour-made goods. Investors have begun to take state-imposed forced labour in China into their ESG considerations. Standards bodies have created guidelines for sourcing to exclude tainted goods. Consumers have sought out goods that they can trust are not made with forced labour.

But few stakeholders have focused on the critical minerals mined and processed in the Uyghur Region. These products, at the farthest end of so many supply chains, seem to remain elusive. Even as industry guidelines and national legislation implement varying degrees of traceability obligations for certain minerals and metals, such efforts have proven limited in effectively tackling the flow of critical minerals mined or processed with state-imposed forced labour from entering global supply chains. Unlike minerals and metals that are traded on commodity exchange markets, which obscures their origins, the critical minerals identified in this report usually enter markets through a network of distributors with direct business-to-business sales between the processors and alloying companies or original equipment manufacturers (OEM).

The complexity of the operating environment does not diminish the need for all stakeholders to address their relationship to the ongoing atrocities in the Uyghur Region and throughout the global minerals supply chain with immediate and decisive action.

Recommendations to the Government of the People's Republic of China

- The PRC government should immediately and unconditionally release all Uyghur and other Turkic people who have been arbitrarily detained and imprisoned in the XUAR and cease all human rights violations in the XUAR.

- The PRC government should end state-facilitated labour transfer programs in the XUAR and comply with its obligations under the International Labour Organization's Abolition of Forced Labour Convention of 1957 (No. 105)'s prohibition on using compulsory labour as a means of political coercion or education, for purposes of economic development, as a means of labour discipline, or as a means of racial, cultural, social, national, or religious discrimination.

- The PRC government must provide all victims of forced labour and wider human rights violations, including Uyghur and other Turkic people, with adequate and effective remedies and reparation.

Recommendations to Other Concerned Governments

- Governments should pass and enforce legislation to prohibit the importation of goods made, in whole or in part, with forced labour, which includes a rebuttable presumption mechanism that can be applied to entire regions or industries where it can be presumed that goods are made with state-imposed forced labour.

- Governments should pass mandatory human rights and environmental due diligence laws as a necessary complement to import bans. Governments should implement human rights due diligence laws with specific mechanisms for identifying and mitigating exposure to state-imposed forced labour across the full supply chain, in alignment with the UN Guiding Principles on Business and Human Rights and the OECD Due Diligence Guidance for Responsible Business Conduct. Risk and impact identification, monitoring, and mitigation reporting should be accessible to the public.

- Governments should ensure bilateral and multilateral engagements on critical mineral security directly address exposure to and avoidance of state-imposed forced labour throughout the minerals supply chain. Partnerships and agreements arising from international collaboration should incorporate binding and enforceable labour, environmental, and human rights standards.

- Governments should exclude products made in whole or in part with state-imposed forced labour, including those in the XUAR, from all government procurement.

- Governments should require companies to publish a list of their critical raw materials suppliers and processors/refiners and document the GPS coordinates where entities at those stages of the supply chain operate.

- The U.S. government should name titanium, lithium, beryllium and magnesium as high-priority sectors under the Uyghur Forced Labor Prevention Act (UFLPA) and should add these products to the Department of Labor's List of Products Made with Child and Forced Labor.

- The EU, Canada, and Mexico should identify these sectors as affected by forced labour for purposes of enforcement of existing forced labour regulations.

- State regulators should consult with relevant stakeholders, including affected communities, the private sector, trade unions, investment firms, academia, and civil society to evaluate existing trade and financial mechanisms and ensure effective enforcement of forced labour regulations.

- Relevant government agencies should dedicate resources to identifying critical minerals outside the scope of this report with high exposure to Uyghur forced labour and prioritise such sectors for enforcement.

- Governments should invest in initiatives, including public-private partnerships, dedicated to reducing global dependence on the Uyghur Region. In particular, governments should dedicate resources to expanding global minerals and metals recycling capacity, as well as fostering material and technological innovations that assure sourcing and manufacturing alternatives.

Recommendations to Private-Sector Entities

- Companies should commit to the call to action of the Coalition to End Forced Labour in the Uyghur Region and, until China demonstrates that it is not engaged in forced labour in the Region, extricate their sourcing and full supply chains from the Uyghur Region. Companies must urgently trace their supply chain and address any points of exposure to Uyghur forced labour at every tier of the supply chain. This includes identifying whether any suppliers outside of the Uyghur Region have participated in state labour transfer programs. Companies should conduct robust supply chain mapping to identify exposure to the XUAR, disengage from all XUAR-based suppliers, and work with suppliers outside of XUAR where risk is found to exclude XUAR sourcing. This mapping should extend across the minerals supply chain, from mining to processing and further downstream manufacturing.

- Human rights due diligence should be a high priority at the board level and be integrated into a company's strategic planning and operations. This ensures that human rights considerations are at the forefront of decision-making. Board oversight establishes accountability and ensures sufficient resources are allocated to implement human rights due diligence processes.

- Companies should make public commitments not to conduct, commission, or review social audits in the XUAR. Companies should only rely on social audits where they are unannounced, where workers are able to speak unfettered and without fear of retaliation and where there are clear demonstrations of a lack of state-imposed forced labour.

- Companies should avoid reliance only on supply chain due diligence or responsible sourcing audits and certifications as an indication of whether or not a supplier is sourcing from the XUAR. They should combine any supplier audit or certification with the supply chain mapping and due diligence measures set out above.

Recommendations to Industry Associations and Certification Bodies

- Industry associations should lead members to collaboratively conduct or commission industry-wide supply chain mapping and analysis of raw materials mining and processing and parts manufacturing in the XUAR. This mapping should extend across the minerals supply chain, from mining to processing and further downstream manufacturing.

- Industry and standard-setting organisations should revise existing best practice guidelines and model contract terms to directly address traceability risks associated with distributors of critical minerals and downstream products sourced from the XUAR.

- Certification bodies should not include as members any companies that have a direct business relationship (ownership, sourcing, or otherwise) with entities or government agencies in the XUAR.

- Certification bodies and responsible sourcing schemes auditing the sourcing practices of companies outside the XUAR should ensure they have robust standards and audit protocols to assess a company's potential links to state-imposed forced labour.

- Certification bodies and auditors should state clearly and publicly that a certification or a positive audit result provides no guarantee of a supplier's freedom from state-imposed forced labour and should be combined with additional due diligence measures.

Recommendations to Investors

- Investors should assess their portfolios for exposure to the Uyghur Region and divest from companies operating in the XUAR or receiving labour transfers from the Uyghur Region.

- Investors should apply leverage on companies sourcing inputs from the Uyghur Region to terminate these relationships, with a strict deadline for compliance before divestment is triggered.

- Investors should join collective investor engagement efforts focused on Uyghur forced labour, including through the Investor Alliance for Human Rights.

- Global Rights Compliance endorses the recommendations for investors outlined in the "Respecting Rights in Renewable Energy" report published by Anti-Slavery International, the Investor Alliance for Human Rights, and Sheffield Hallam University, including investor engagement with ESG providers to incorporate more effective indicators for identifying state-imposed forced labour and other human rights issues.

Endnotes

All corporate responses to this report can be found in an annex to this report on the Global Rights Compliance website.

Most citations below reference an archived version of the website where the information can be found. Where that is not possible, PDF version is provided provided on the GRC website.

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