

An aerial, top-down view of a large industrial yard or port area. The ground is paved and filled with various pieces of heavy machinery and vehicles, predominantly yellow. In the center, a long yellow truck is oriented vertically. To its right, several other yellow trucks are parked in a row. The background shows more industrial structures and equipment, creating a sense of a busy, large-scale operation.

Situation Report:

# The Impact of China's Export Controls on Critical Metals



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## ● Executive Summary

**Export Controls were announced** for 25 rare materials (most importantly **Tungsten, Indium, Bismuth** and **Tellurium**) on **February 4, 2025** and went into immediate effect. Exporters must now obtain licenses under China's Export Control Law.

China's recently-imposed export controls are poised to disrupt global supply chains, driving significant price increases and operational risks for U.S. industries, as well as for major economies in Europe, Japan, and South Korea. The U.S. is especially vulnerable, as it relies almost entirely on imports with minimal domestic production and government reserves (e.g., a limited tungsten stockpile covering a few months' demand). Previous export restrictions (rare earths in 2010, gallium/germanium in 2023, and antimony in 2023–2024) have triggered price surges of 100–200% or more.

Current projections suggest **short-term price increase of 20–50%** and, under severe scenarios, prices could potentially **double** within 6–24 months if alternative sources are not secured. In Europe and other key regions, similar risks exist. Although some regional initiatives are underway to diversify supply, the heavy reliance on Chinese exports remains a critical vulnerability. Moreover, China may next target other strategic materials such as graphite or rare earth magnet components, further reshaping the global supply landscape.

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## 2. Market Insights & Dependencies

### China's Dominance & Global Sourcing

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#### Tungsten:

- **Global Share:** China produces >80% of global tungsten, controlling both mining and refining.
- **U.S. Impact:** After domestic mining ceased in 2015, the U.S. is now import-dependent.
- **European & Other Key Economies:** European defense and industrial sectors also rely heavily on imported tungsten. Limited European mining (e.g., in Austria) cannot match Chinese output.
- **Usage:** Critical for defense (armor-piercing munitions, tank armor) and industrial tooling (cutting tools, drilling bits).

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#### Indium:

- **Global Share:** China accounts for roughly 70% of refined indium.
  - **U.S. Impact:** The U.S. is entirely import-dependent; Indium is essential for ITO coatings used in touchscreens, LCDs, and semiconductor devices.
  - **European/Japanese/Korean Impact:** These regions, major players in electronics and semiconductor manufacturing, also face severe risks if supply contracts are disrupted.
  - **Recycling:** Approximately 40% of indium is recovered from manufacturing scrap, primarily in Japan and Korea.
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#### Bismuth:

- **Global Share:** Over 80% of bismuth is produced and refined by China, primarily as a byproduct.
- **U.S. & European Impact:** Both regions have no domestic production and rely on imports for applications such as lead-free solders and specialty alloys.
- **Recycling:** Recycling is minimal (<10%), leaving consumers almost entirely dependent on primary refining.

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## Tellurium:

- **Global Share:** Roughly 75% of refined tellurium comes from China, recovered from copper refining.
- **U.S. & European Impact:** Critical for CdTe solar panels and thermoelectric devices, tellurium's limited refining capacity outside China poses challenges for both U.S. renewable energy projects and European tech manufacturers.
- **Recycling:** Currently, <5% is recycled, though untapped potential exists in copper anode slimes and future end-of-life solar panel recovery.

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## Supply Chain Dependencies

- **Mining/Sourcing:**
  - The U.S., Europe, and Japan lack significant domestic production for tungsten, indium, and bismuth, with tellurium production minimal.
  - Key alternative mining sources include Vietnam (for tungsten), Canada (for indium and tellurium), and select projects in Africa and Latin America (for bismuth).
- **Refining:**
  - China dominates refining for these metals. Alternative refining capacity exists in South Korea, Japan, and parts of Europe (e.g., Austria for tungsten, Belgium for indium and bismuth), but these operations are much smaller than Chinese output.
- **Recycling:**
  - Tungsten recycling is relatively mature, with European facilities meeting up to 45–50% of regional demand.
  - Indium recycling from manufacturing scrap is significant in East Asia, though recycling from post-consumer waste remains limited.
  - Bismuth and tellurium recycling currently provide only a small buffer.
  - Expanding recycling capacity and improving refining technologies are critical to reducing dependency on China.

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## 3. Historical Context & Lessons Learned

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### Rare Earth Elements (2010)

- **Event:** China imposed export quotas on rare earths (accounting for over 90% of global supply).
- **Impact:** Prices surged by hundreds of percent, disrupting key industries in the U.S. and Europe (automotive, defense, green tech).
- **Response:** Western nations (including the EU, Japan, and the U.S.) initiated WTO actions and boosted domestic mining and recycling initiatives.

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### Antimony (2023–2024)

- **Event:** Export restrictions reduced Chinese antimony shipments by 97% to the U.S.
- **Impact:** European prices surged by over 200%, causing production delays in defense and chemical sectors.
- **Response:** Governments initiated emergency measures, increasing investments in domestic production and strategic stockpiling.

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### Gallium & Germanium (2023)

- **Event:** Introduction of export licensing led to bans on U.S. exports.
- **Impact:** Gallium prices jumped ~27% within weeks, supply impacts affected semiconductor and LED production.
- **Response:** Western manufacturers sourced from secondary suppliers (Korea, Japan, Canada) and pushed for supply chain diversification.

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### Key Lessons:

- Rapid, severe price shocks and production slowdowns are common outcomes.
- Diversification of supply, enhanced recycling, and strategic stockpiling are essential to mitigate risks.

## 4. Key Market Trends & Industry Impact

### Supply Tightness and Price Volatility:

- **Tungsten & Indium:** Trading is at elevated prices due to supply concerns. With China dominating supply, export restrictions have pushed tungsten prices into the low-\$300s/MTU range and indium prices above \$300/kg.
- **Bismuth:** The February 2025 spike—,where prices surged to approximately \$18,200/metric ton—, demonstrates the market’s sensitivity to export disruptions.
- **Molybdenum & Tellurium:** Although volatile, these metals have experienced moderate fluctuations, with molybdenum peaking sharply in early 2023 before retracing and tellurium maintaining steady ranges.

### Industries Most Affected:

- **Defense & Industrial Tooling (Tungsten):** Companies depend on tungsten for high-performance alloys and cutting tools.
- **Solar & Semiconductor (Tellurium):** Companies rely on tellurium for CdTe solar panels, while semiconductor companies incorporate it in memory chips.
- **Electronics & Pharmaceuticals (Bismuth):** Electronics manufacturers and pharmaceutical firms use bismuth in lead-free solders and medical products.
- **Steelmaking & Aerospace (Molybdenum):** Major steel producers and specialty alloy manufacturers are highly dependent on molybdenum.
- **Consumer Electronics (Indium):** Companies require indium for ITO coatings in screens.

Month	Tungsten (APT, \$/MTU)	Tellurium (\$/kg)	Bismuth (\$/metric ton)	Molybdenum (\$/ton)	Indium (\$/kg)
Dec 2022	~\$270 USGS Tungsten	~\$80 TradingEconomics - Tellurium	~\$9,140 <u>IndexBox</u>	~\$41,336 USGS, Argus Metals	~\$445 USGS
Jun 2023	~\$325 Argus Metals Market Update	~\$95 Industry Data	~\$6,360 (avg) Industry Averages (MarketWatch)	~\$47,399 USGS, Metal Bulletin	~\$220 USGS
Dec 2023	~\$260 Argus Metals Price Trends	~\$100 TradingEconomics - Tellurium	~\$9,025 <u>IndexBox</u>	~\$45,746 USGS, Metal Bulletin	~\$240 USGS
Mar 2024	~\$300 Reuters - Tungsten	~\$88 Reuters, TradingEconomics	~\$7,800 <u>IndexBox Report</u>	~\$43,000 USGS Molybdenum	~\$230 USGS Indium
Jun 2024	~\$310 Reuters - Tungsten	~\$92 TradingEconomics - Tellurium	~\$8,400 <u>IndexBox Report</u>	~\$44,500 USGS Molybdenum	~\$235 USGS, Argus Metals
Sep 2024	~\$295 Reuters - Tungsten	~\$96 TradingEconomics - Tellurium	~\$9,000 <u>IndexBox Report</u>	~\$46,000 USGS Molybdenum	~\$240 USGS, Argus Metals
Dec 2024	~\$280 Reuters - Tungsten	~\$100 TradingEconomics - Tellurium	~\$9,200 <u>IndexBox Report</u>	~\$45,000 USGS Molybdenum	~\$245 USGS, Argus Metals
Feb 2025	~\$330 Reuters Update	~\$100 Reuters, TradingEconomics	~\$18,200 Reuters (Feb 21, 2025)	~\$50,700 USGS Molybdenum	~\$300+ USGS, Argus Metals

Note: Only months with published, verifiable data from trusted sources are included. Some data are from News Articles only.

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## 5. Outlook for Future Restrictions

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### Possible Next Targets

- **Graphite:**
  - China supplies ~77% of natural graphite and nearly 100% of battery-grade graphite. A ban would directly impact EV battery production globally, with severe consequences for Europe's and the U.S.' automotive sectors.
- **Rare Earth Magnet Materials:**
  - NdFeB magnets, essential for EV motors, wind turbines, and defense systems, are predominantly produced in China. Restrictions here would disrupt high-tech and renewable industries in Europe, Japan, and the U.S.
- **Advanced Semiconductor Inputs:**
  - High-purity fluorine compounds and other niche materials used in chip fabrication may be next, affecting semiconductor manufacturing across major tech hubs.
- **Battery Metals (Cobalt/Nickel):**
  - Although less likely due to interdependencies, restrictions on refined cobalt or nickel could occur if geopolitical tensions escalate further, impacting EV and electronics production.

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### Global Implications

- **U.S. Impact:**
  - Continued dependency on Chinese imports heightens the risk of price shocks and production delays in critical sectors such as defense and high-tech manufacturing.
- **Europe:**
  - With heavy reliance on Chinese refined tungsten, indium, and bismuth, European industries (especially defense, automotive, and renewable energy) face similar risks. EU initiatives aim to diversify supply, but short-term vulnerabilities persist.
- **Asia (Japan & South Korea):**
  - These nations maintain partial stockpiles and recycling capacity but remain exposed to supply disruptions, potentially impacting semiconductor, battery, and display industries.

Coordinated global responses are expected, with increased investments in domestic production, recycling, and strategic partnerships among the U.S., EU, Japan, and South Korea.

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## 6. Strategic Recommendations

### 1. Diversify Supply Sources:

- Secure alternative suppliers in **Vietnam, South Korea, Canada, Chile, and Mexico.**
- Form long-term offtake agreements to mitigate reliance on Chinese exports, leveraging "friend-shoring" strategies.

### 2. Enhance Inventory Management:

- Build company-level safety stocks to cover 3–6 months of consumption.
- Note that existing government stockpiles (e.g., U.S. tungsten reserves) are limited; private inventory buffers are essential.

### 3. Invest in Recycling & Domestic Processing:

- Scale up recycling programs for tungsten and indium, where existing secondary supply can potentially rise from 30–40% to 50% or more with proper incentives.
- Support R&D for advanced recycling techniques (e.g. AI-based sorting, low-acid leaching for indium recovery, and direct powder recycling for tungsten).
- Foster domestic refining projects in the U.S., Europe, and allied nations to reduce reliance on Chinese processing capacity.

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#### **4. Increase Supply Chain Transparency & Collaboration:**

- Map critical supply chains to identify vulnerabilities.
- Participate in multilateral initiatives such as the Minerals Security Partnership, enhancing coordination among the U.S., EU, Japan, and South Korea.
- Collaborate with trade organizations and government agencies to advocate for supportive policies, including strategic stockpiling and expedited permitting for new mining/refining projects.

#### **5. Prepare for Future Restrictions:**

- Monitor developments on potential future bans (e.g. graphite, rare earth magnets, advanced semiconductor inputs) and adjust procurement strategies rapidly.
  - Develop contingency plans to lower material intensity in high-value products, including substitution opportunities and efficiency improvements.
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### **● Conclusion**

China's export controls on tungsten, indium, bismuth, and tellurium present an immediate risk of supply disruptions and significant price increases. The U.S. and Europe—, along with major economies in Asia such as Japan and South Korea—, are all highly dependent on these critical metals. Historical precedent indicates that such controls can trigger rapid, severe market shocks. With short-term price increases expected to reach 20–50% and may double under severe scenarios, proactive measures are essential.

Key strategies include diversifying supply sources, enhancing inventory management, and ramping up recycling and domestic refining capacity. Additionally, coordinated policy responses and multilateral collaboration will help mitigate risk and prepare for potential future restrictions.

Taking decisive action now will help build a more resilient, sustainable supply chain that reduces geopolitical vulnerabilities and secures the inputs critical to defense, high-tech, renewable energy, and industrial manufacturing.