



DANGERS UPSTREAM: CRITICAL RAW MATERIALS, GEOPOLITICAL RISKS & THE SEMICONDUCTOR SUPPLY CHAIN

Is your organization keeping a close eye on the upstream semiconductor supply chain? I'm referring to the initial part of the supply chain that transports raw materials from source to production line – the part dominated not by technologically advanced democracies but by China and Russia.

If this isn't yet at the top of your agenda, it should be.

Without the right ingredients, the world cannot increase nor even maintain current production levels of semiconductor chips and semiconductor capital equipment machines. No matter how many US\$20-billion fabrication plants (fabs) are strategically located and built, the output of chips would be choked, causing a crisis for manufacturers around the world.

Dramatic scenario

Lower volumes of transistors, diodes, sensors, and integrated circuits would deprive customers in all industries, perhaps most critically impacting the digital transition and the energy transition, as well as military and defense applications. Everything would drastically slow down and even come to a standstill.

I've used this dramatic scenario to illustrate the importance of the upstream supply chain and the very real dangers. Semiconductor production relies on the chemicals that are made from critical raw materials (CRM) which must be mined, refined, converted, and processed. But productive CRM sources are extremely limited.

Limited CRM availability

Palladium, cobalt, and neon gas must be obtained from Russia, and most of the world's neon gas comes from Ukraine. Silicon, gallium, germanium, rare earth elements, and cobalt must be acquired from China, with further cobalt from Chinese-owned mines in Democratic Republic of the Congo and various southern African countries.

Back in time, the US and Europe closed their own CRM mines due to environmental concerns, stricter regulations, falling profits, and of course competition from cheaper Russian and Chinese sources. To re-open these mines would be costly, both in financial and environmental terms, and it would necessitate skilled workers. Past experience indicates that opening an entirely new mine takes 16 years, on average, according to the International Energy Agency.

Levers of power

With limited productive sources, critical raw materials now represent levers of power for Beijing and Moscow, something that is undoubtedly fueling geopolitical tensions. The response of many governments and corporates around the world has been to introduce wide-reaching chip acts, initiatives, and alliances – all of which seek to reset the balance of power and secure future advantage.

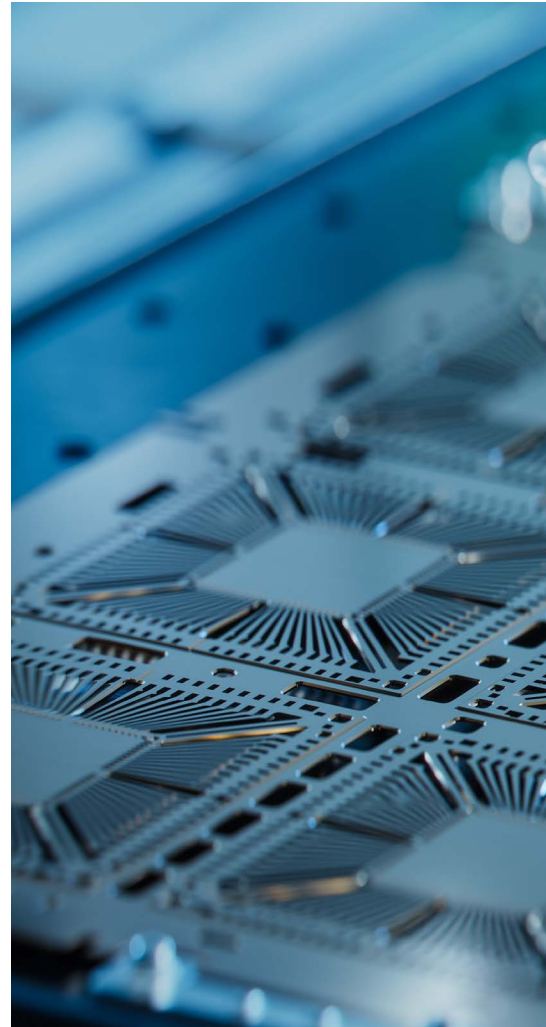
It seems clear that the interlinking semiconductor and CRM ecosystem has become “the foundation of today's world economy.” This phrase was shared by Joris Teer, Strategy Analyst at The Hague Centre for Strategic Studies (HCSS) during DHL's Global Summit – The Era of Sustainable Logistics – in April. This was at an extremely well attended roundtable event on the geopolitics of semiconductors and CRM. My colleagues tell me we could have filled this session several times over – an indication that business leaders and logistics professionals certainly recognize the urgency of understanding and addressing critical upstream issues.

Futureproofing the supply chain

Given this new world economy, it's more important than ever before to implement effective risk management strategies in the semiconductor industry.

For greater resilience in the upstream supply chain, companies should consider accelerating digitalization initiatives, building stronger partnerships, developing resilient product and inventory strategies, and reducing environmental impact. There is a lot to explore behind each of these areas of focus and a great resource for this is the DHL white paper Resilience of the Semiconductor Supply Chain.

Upstream is not yet in crisis but one day it could be. Every technology company needs to be aware of the danger and futureproof this part of the semiconductor supply chain.



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