

## Clean Technology and the Paradox of Progress

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### Key takeaways:

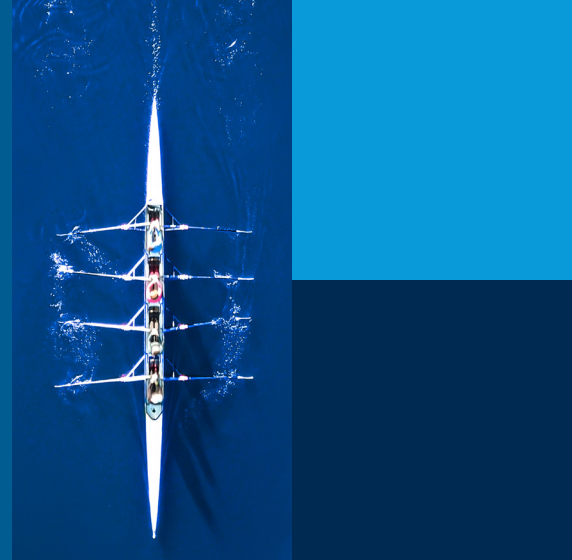
- While clean tech's takeoff marks a positive step forward on the path to net-zero, renewable technologies are not without their own problems.
- Specifically, global supply chains appear as key areas of vulnerability, exposing companies to environmental, social and governance (ESG) concerns, such as biodiversity loss, human rights abuses and more.
- In our view, a pragmatic approach grounded in strong governance standards is best suited to resolve these tensions while supporting meaningful climate solutions.
- The Global Balanced Risk Control (GBaR) Strategy<sup>1</sup> ESG process is tilted toward the strongest ESG performers and harnesses engagement on material ESG issues (including supply chain sustainability), with the aim of providing better risk-adjusted returns and measurable improvements in sustainability outcomes.

Since the dawn of the industrial age, observers have repeatedly noted that the forward march of progress is often accompanied by unforeseen and unintended consequences. This simple idea, known as the paradox of progress, is neatly encapsulated by debates around fossil fuels and climate change. On the one hand, fossil fuels helped underpin the development of modern industrialized economies, but on the other, greenhouse gas emissions have contributed to outcomes such as global warming and environmental degradation.

Fortunately, clean energy technologies, such as solar, wind and energy storage, give us a credible chance to tackle climate change. And as costs plummet,<sup>2</sup> we

<sup>1</sup> The Portfolio Solutions Group has a long-established approach to managing global multi-asset portfolios, within a risk-controlled framework.

<sup>2</sup> According to the International Renewable Energy Agency, solar PV module prices have fallen by around 90% since the end of 2009, while wind turbine prices have fallen by 49%-78% since 2010.



### AUTHORS



**JIM CARON**  
Chief Investment Officer  
Portfolio  
Solutions Group



**LI ZHANG**  
Executive Director  
Portfolio  
Solutions Group

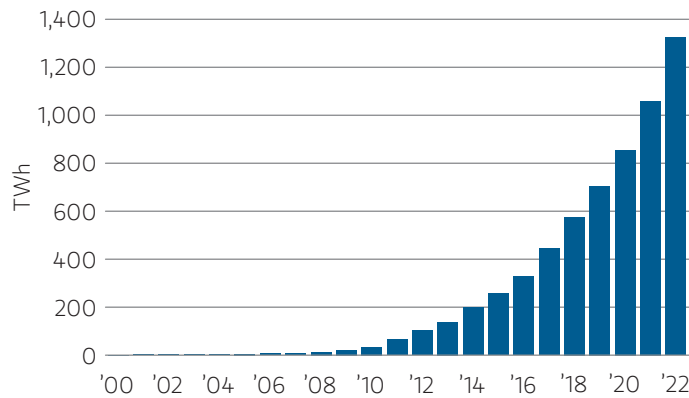


**KIAN MASTERS**  
ESG Analyst  
Portfolio  
Solutions Group

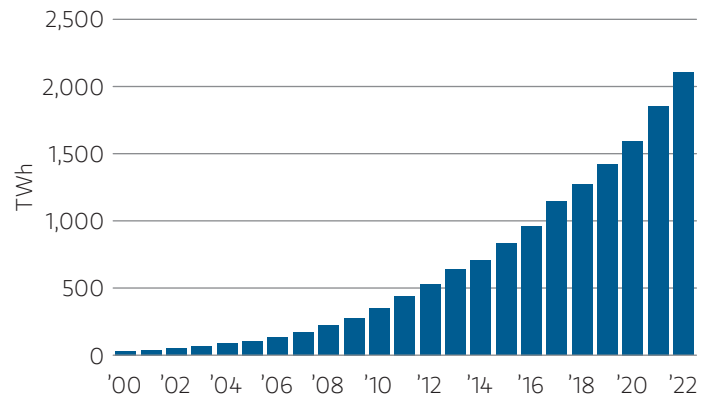
**DISPLAY 1**

**Clean Energy's Remarkable Growth**

Solar Generation  
CAGR: 38%



Wind Generation  
CAGR: 21%



Source: Energy Institute Statistical Review of World Energy. As of June 26, 2023.

are witnessing a “Cambrian explosion” in clean energy buildout (*Display 1*) to the extent that renewable power generation is meeting almost all net electricity demand growth globally (*Display 2*).

However, clean technologies are not without their own externalities. Admittedly, unlike billowing chimneys,

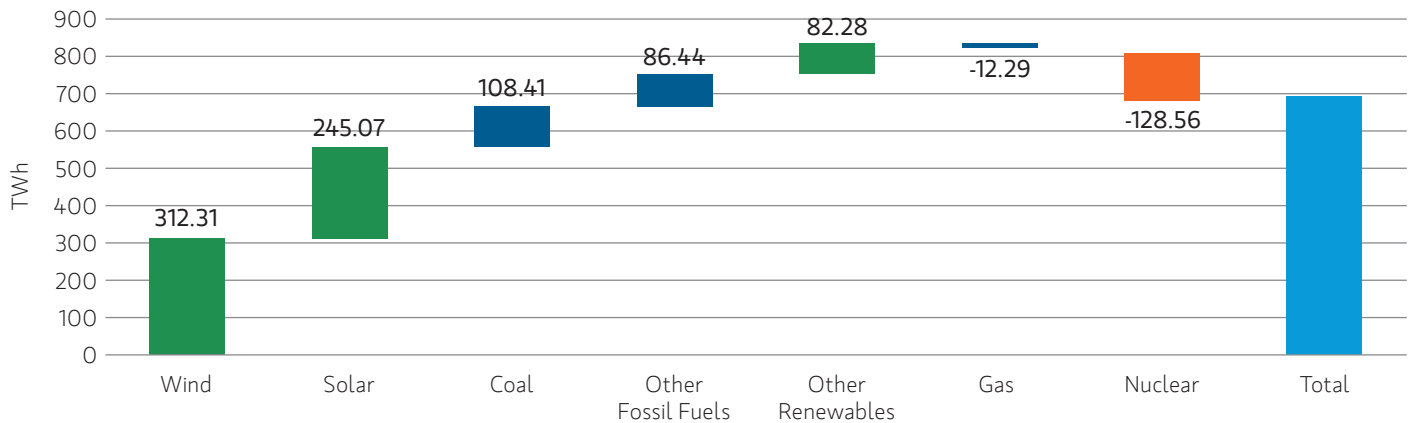
these externalities are harder to detect, typically lurking in far-flung corners of complex supply chains.

With trillions of dollars earmarked for deployment toward renewable energy development, we believe global decarbonization efforts will provide structural demand growth

for clean energy and its supporting infrastructure. It is therefore crucial to understand which areas of the industry’s supply chains are most exposed and how ESG trade-offs can be minimized to make meaningful progress in the fight against climate change, without undermining other sustainability goals.

**DISPLAY 2**



**Solar and Wind Met Over 80% of Global Electricity Demand Growth in 2022**



Source: EMBER.

**DISPLAY 3**

**Climate-Related Targets and Incentives**

REGION	ACTIVITY
 <p><b>UNITED STATES</b></p>	<b>LONG TERM:</b> Net-zero by 2050
	<b>SHORT TERM:</b> Reduce emissions by 50%-52% below 2005 levels by 2030
	<b>POWER GENERATION:</b> Achieve a 100% emissions-free electricity sector by 2035
	<b>FUNDING:</b> While the Inflation Reduction Act provides \$392 billion in direct spending, additional provisions for loan guarantees, as well as incentives in other legislation, bring funding to around \$950 billion
 <p><b>EUROPEAN UNION</b></p>	<b>LONG TERM:</b> Net-zero by 2050
	<b>SHORT TERM:</b> Reduce emissions by at least 55% below 1990 levels by 2030
	<b>POWER GENERATION:</b> Increase renewables from a 32% share of total energy to 42.5% by 2030, with an additional 2.5% “indicative” target
	<b>FUNDING:</b> €1.5 trillion is estimated to be available through EU funds, with the remainder needed to be provided by national-level or private businesses

Sources: Climate Action Tracker (2023). Morgan Stanley estimates. MSIM. Estimates are subject to change and may not actually come to pass.

**Green Carrots Meet Green Sticks**

The passage of the U.S. Inflation Reduction Act (IRA) in August 2022 underscored industrial policy’s role as the principal catalyst driving investment into clean energy technologies (*Display 3*). Notably, the EU rolled out its own initiatives to keep pace with the U.S. and to foster clean tech growth at home. State-level support has focused on developing and scaling up the U.S.’s own domestic industry in critical technology, such as clean tech, to decarbonize their economies while reducing reliance on potential geopolitical rivals.

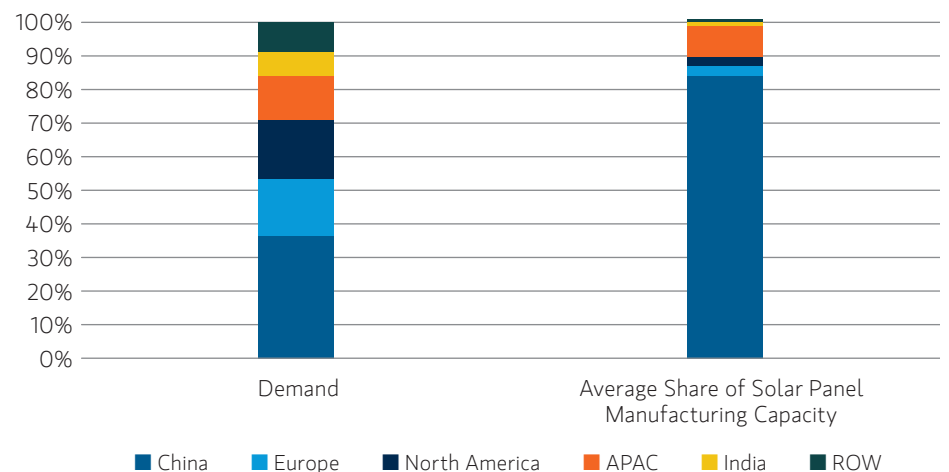
While the figures provided above are an estimate and subject to change, particularly in the case of the EU, a common thread running through both regulatory initiatives is the desire to onshore manufacturing and supply chains. However, in the short term, such goals may be more challenging. The U.S. and the EU have little to no

domestic manufacturing capacity for key technologies such as solar energy at present. Consequently, the pace of development needs to rapidly ramp up to meet the ambitious reduction targets that are fast approaching (*Display 3*).

Imports will therefore continue to play an important role until domestic manufacturing can step in to fill the void between Western demand (i.e., the U.S. and Europe) and production (see example of solar in *Display 4*).

**DISPLAY 4**

**Share of Demand vs. Manufacturing Capacity**



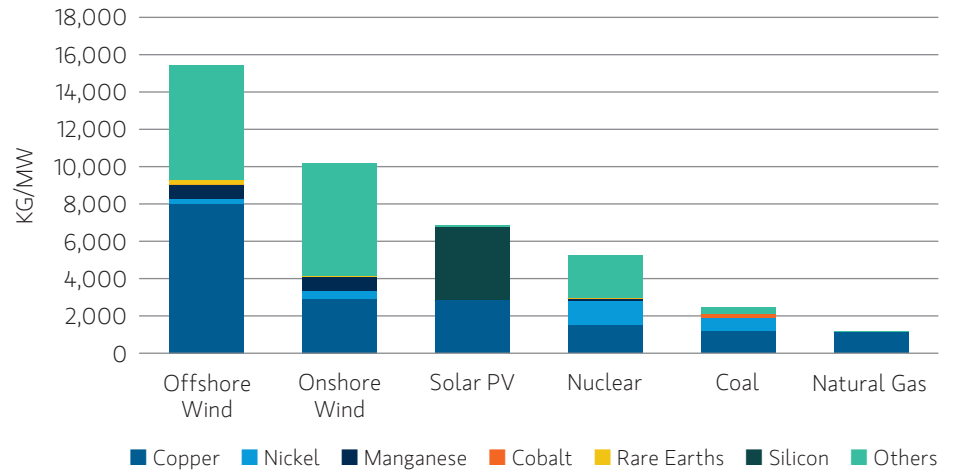
Source: “Solar PV Global Supply Chains: An IEA Special Report.” IEA. As of August 2022.

## Supply Strains

The energy transition will require an array of mineral and metal inputs. We expect the buildout of solar, wind and energy storage technology to become a significant driver of global mining activity. According to the International Energy Agency (IEA), the demand for minerals used in clean energy technologies will increase four-to-six times over the next 20 years.<sup>3</sup>

This increase in mining activity brings with it serious environmental and social implications. For example, the construction of large mines and the use of scarce water resources can create conflict with local communities. Additionally, a key component of the energy transition, rare earth minerals,<sup>4</sup> is produced using methods that damage soil and water and release hazardous chemicals that threaten miners and communities near to extraction sites.<sup>5</sup>

**DISPLAY 5**  
**Minerals Used in Energy Technologies**

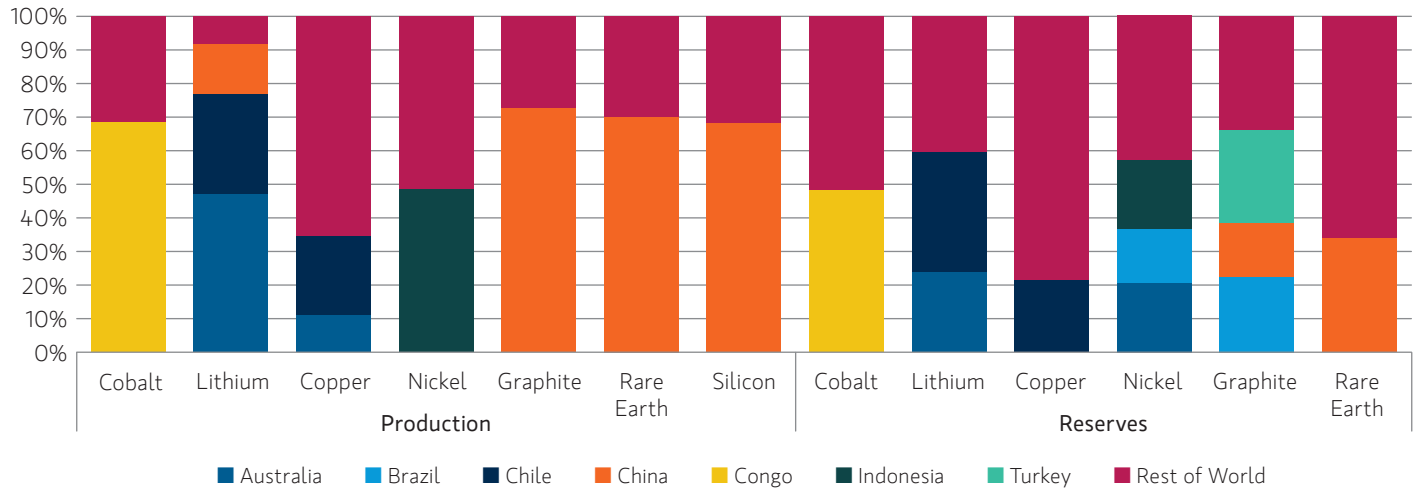


Source: "The Role of Critical Minerals in Clean Energy Transitions." IEA. As of March 2022.

Unforgiving working conditions in highly dangerous environments, where miners spend long hours in dark, hot and poorly ventilated mines, raise serious questions over human rights and worker safety. For developing countries, where many crucial deposits are concentrated (Display 6), these issues are exacerbated

by weak governance, dependencies on mining income for development and high exposure to one or more sustainability risks. While reserves of minerals are typically more disparate than current production, the current concentrated nature of extraction poses potential ESG risks.

**DISPLAY 6**  
**Transition Minerals and Metals Concentration<sup>6</sup>**



Source: United States Geological Survey (USGS), Mineral Commodity Summaries. As of January 31, 2023.

<sup>3</sup> "The Role of Critical Minerals in Clean Energy Transitions." IEA. March 2022.

<sup>4</sup> Contrary to their name, rare earths are relatively abundant. "Rare" refers to their low concentration compared with other metal ores.

<sup>5</sup> "Not So "Green" Technology: The Complicated Legacy of Rare Earth Mining." Harvard International Review. August 12, 2021.

<sup>6</sup> Reserves of silicon are abundant and, in most producing countries, adequate to supply world requirements for many decades. The source is in various natural forms, such as quartzite. Quantitative estimates are not available.

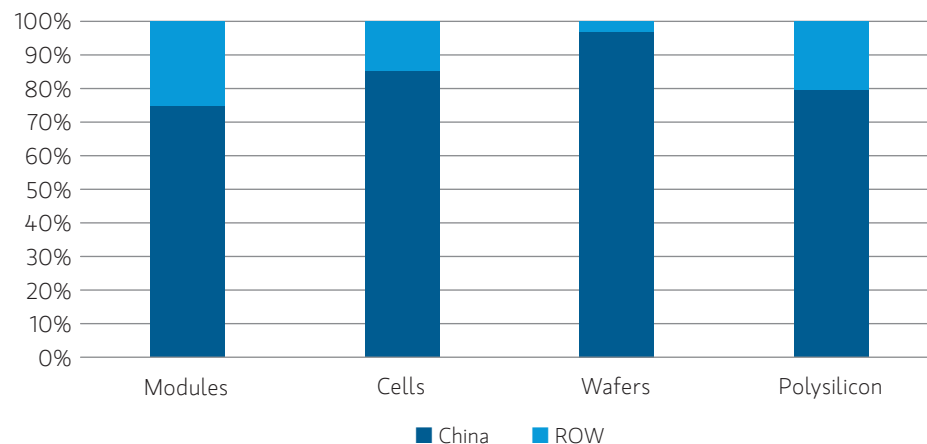
For example, 10%-20% of the Democratic Republic of Congo's (DRC) cobalt supply comes from artisanal mining operations (i.e., small-scale, informal mines),<sup>7</sup> which also provides essential income to some of the world's poorest people.<sup>8</sup> However, these mines are often dangerous, lacking any meaningful safety provisions, and child labor is common. With the DRC reliant on mining for 90% of its export income, and the world reliant on cobalt to power our lithium-ion batteries,<sup>9</sup> it is imperative that refiners, large mining companies and governments work to minimize the harm caused by cobalt extraction.

Downstream, the clean energy manufacturing industry is also heavily reliant on global but concentrated supply chains. China dominates the global solar manufacturing supply chain, as well as the refining process, for many of the metals and minerals outlined above—its coal generators provide cheap power for the energy-intensive processing and manufacturing throughout the clean tech value chain.

For example, a significant portion of the upfront carbon emissions in silicon-based solar PV is attributed to electricity inputs required during the manufacturing process,<sup>10</sup> which China dominates. Installing solar may reduce local emissions, but the impact on global emissions may be far less than it seems.

Concerns about human rights conditions are also a significant concern. In the U.S., the Uyghur Forced Labor Prevention Act (UFLPA), which took effect on June 21 2022, prohibits the import of goods from the Xinjiang province unless

#### DISPLAY 7 China Dominates Solar Supply Chain



Source: "Solar PV Global Supply Chains: An IEA Special Report." IEA. As of August 2022.

the importer can provide "clear and convincing evidence" that forced labor was not used in production.

Underlining the potential for disruption, Reuters reported a 23% drop in utility-scale solar installations in the U.S. in 2022, as projects faced delays because of the legislation.<sup>11</sup> With highly concentrated supply chains in areas with potential for ESG risk and only minimal solar panel production in importing markets, further regulation, such as the EU's proposed Corporate Sustainability Due Diligence Directive (CSDDD), could pose challenges to decarbonization aspirations.

#### Pursuit of the Practical

To meet shorter-term decarbonization targets, businesses must continue to source from global supply chains with potential high exposure to ESG risks. There are no easy solutions to this predicament, which, in our view, underscores the need for a

pragmatic approach that is underpinned by strong governance.

**COMPANIES.** Clean tech companies can take a number of concrete steps to strengthen governance throughout supply chains and to reduce exposure to ESG risks. To start, corporate leaders should make continuous efforts to increase the traceability and visibility of products and inputs from the start of the supply chain all the way through to the point of sale. Large clean tech procurers should establish clear policies around human rights violations and environmental abuses. They should also seek to cooperate with companies to mitigate less severe problems.

Having a range of vetted suppliers is critical to a strong procurement regime, as it aids flexibility and can potentially reduce ESG exposures—e.g., substituting Russian gas for green alternatives—particularly, where supply chains can be more localized, reducing carbon-intensive shipping dependencies.

<sup>7</sup> "Artisanal Mining, Livelihoods, and Child Labor in the Cobalt Supply Chain of the Democratic Republic of Congo." Center for Effective Global Action. May 6, 2017.

<sup>8</sup> According to the World Bank, the DRC is among the five poorest nations in the world.

<sup>9</sup> Other technologies are currently in development which could see a move away from reliance on cobalt. However, most third-party scenarios see an increase in cobalt demand in all decarbonization pathways.

<sup>10</sup> "A Polysilicon Learning Curve and the Material Requirements for Broad Electrification with Photovoltaics by 2050." Hallam et al. 2022.

<sup>11</sup> "U.S. solar builders face delivery woes in pull away from China." Reuters. As at 3 March, 2023.

Companies should make every effort to invest in innovation, where practical.

Lastly, as the complexities that exist across the clean tech supply chain materialize, corporate leaders need to honestly assess sourcing challenges and disclose vulnerabilities in their ESG reporting. Companies able to articulate their ESG priorities, KPIs and implementation plans in open and honest conversations with investors should have more fruitful engagements about the viability of their strategies.

**INVESTORS.** Even if asset managers invest in companies with high ESG standards, as we seek to do, sustainability risks can still be concealed within highly complex global

sourcing networks. For this reason, we place an emphasis on supply chain due diligence when engaging with the clean energy sector. A supply chain is only as strong as its weakest link.

In our view, the climate crisis will not be solved by one perfect solution, rather, it will be addressed through a series of tradeoffs and compromises. However, the path to net-zero must not come at the expense of human rights or biodiversity degradation.

Ignoring these very real issues is not an option. We believe that a pragmatic, outcomes-driven ESG integration and engagement approach is the way forward. Academic evidence<sup>12</sup> supports the notion that tilting portfolios away

from poorer-performing companies to leaders, while engaging with defined goals and expectations, more effectively minimizes externalities than divestment from poor performers alone.

The GBaR Strategy ESG process is tailored to do exactly this. By tilting our regional baskets toward the companies we view as the strongest ESG performers within each sector, engaging on material ESG issues, including supply chain sustainability, and excluding companies implicated in the most severe controversies, we seek to not only provide our clients with better risk-adjusted returns but also a measurable improvement in sustainability outcomes.

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<sup>12</sup> Can Sustainable Investing Save the World? Reviewing the Mechanisms of Investor Impact. Julian F. Kölbel, Florian Heeb, Falko Paetzold, Timo Busch, 2020 (sagepub.com). Socially Responsible Divestment - Alex Edmans, Doron Levit, and Jan Schneemeier, 2022 (SSRN).



## DEFINITIONS

**Biodiversity:** The diversity of living organisms that make up natural capital.

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