To scale up, the EU needs clear pathways for clean-energy supply chains in mining and manufacturing.

The global shocks of recent years, including the pandemic, Russia’s invasion of Ukraine and resulting commodity-price inflation, have disrupted clean-technology supply chains. This has led to higher prices for wind-power technology and batteries and slower price falls for solar panels.

Europe’s green industry is particularly exposed to supply-chain shocks, given its dependency on imports of raw materials and components. This is particularly so for solar photovoltaic (PV) equipment and batteries for electric vehicles, with supplies highly concentrated in China. Struggles for profitability on the part of domestic wind manufacturers and the prospective reduction of the European operations of the chemicals multinational **BASF** have led to further soul-searching about Europe’s manufacturing and industrial base.

To address these vulnerabilities, in February the European Union announced its **Green Deal Industrial Plan. At its heart, the Net-Zero Industry Act (NZIA)**, sets the goal that 40 per cent of the technology required for the EU’s ambitions for cuts in greenhouse-gas emissions be manufactured in Europe by 2030. Alongside this, the Critical Raw Materials Act (CRMA) includes domestic targets across mining, refining and recycling—as well as measures to accelerate permits for manufacturing and a potential loosening of state-aid constraints.

Clean-energy manufacturing need not be a zero-sum game: demand for all clean technologies will scale so rapidly that European manufacturing can complement mining and manufacturing elsewhere. Mining of critical metals and minerals at scale is currently lacking in Europe.

Hard pressed

The latest analysis from the Energy Transitions Commission finds that, especially for copper (used in all clean technologies) and lithium (integral to batteries), the addition of mining capacity globally will be hard pressed to meet growing demand through to 2030. This is largely due to long lead times (up to 15-20 years) and lack of investment in projects. Both metals are listed in the EU’s list of Strategic Raw Materials, with domestically mined supply targeted in the CRMA to meet 10 per cent of EU demand by 2030.

Domestic copper production currently meets 14 per cent of demand, but without investment in new capacity that share is expected gradually to decrease. It will be challenging to meet CRMA requirements for both domestic-mined and refined supply (the latter 40 per cent of demand by 2030).

Of even greater concern is lithium: the EU has no capacity in the mining or refining of battery-grade lithium. Some projects are on the horizon in Finland, Serbia, Portugal and Germany, but many have faced local opposition due to environmental concerns and none is yet onstream. Production will need to expand rapidly to meet CRMA requirements—from about 600 tonnes of mined supply in 2022 to 25,000 tonnes in 2030.

Across clean-technology components, the EU has strong manufacturing capabilities in wind (its ‘crown jewel’), heat pumps and electrolysers for green-hydrogen production. With the right policy support and enabling conditions, scaling these supply chains quickly should be feasible in the coming years.

The domestic manufacturing target in the Net Zero Industry Act will however be challenging for solar PV and batteries, where EU capacity is minimal. Around €13 billion in solar supply chains and €63 billion for batteries and associated materials could be needed to meet NZIA requirements in 2030.

Trade-offs to consider

There will also likely be trade-offs to consider. High upfront capital costs to ‘near-shore’ manufacturing to the EU and high energy and power prices must be weighed against political priorities such as the potential for new jobs and tax revenues as well as geo-strategic considerations. Timescales for permits, access to finance and in some cases having to start (or restart) metals and minerals mining and manufacturing from a low base can all influence the feasibility of near-shoring. A balanced policy approach to support the energy transition should evaluate trade-offs across all supply-chain challenges, addressing possible market tightness in an environmentally and socially sustainable manner.

Clean-technology supply chains can have significant environmental impacts, from biodiversity to water usage and embodied carbon emissions (even if operating emissions are far lower than for fossil-fuel alternatives). Furthermore, production of polysilicon used in solar PV in Xinjiang province in China and the supply of cobalt for batteries from the Democratic Republic of Congo raise human-rights concerns. Sustainable scale-up of clean energy technology depends on responsible and regulated supply chains.

The EU can continue to be influential in implementing stringent environmental and social standards, such as by mandating that all tender processes in the union involve assessments of embodied carbon emissions, following the ‘simplified carbon assessment’ introduced in France. This would build on the **Carbon Border Adjustment Mechanism (CBAM)**, which aims to address carbon ‘leakage’. The EU can also develop strategic partnerships with key supplier countries and drive data-sharing to increase transparency of supply pipelines.

It can also foster a new generation of clean, low-impact, sustainable manufacturing. New

projects could be rewarded by streamlined planning and permission when high environmental and social standards are met. This way critical mines and manufacturing infrastructure could be built quickly while protecting the EU’s strong history of environmental stewardship—and, crucially, ensuring buy-in from affected communities.

Funding contentious

A key point of contention will be the funding arrangements associated with the new EU policy packages. Will these be able to match the generous, straightforward tax credits offered under the Inflation Reduction Act (IRA) in the United States?

Analysis of EU and member-state funding for clean energy suggests the total on offer might be around €800 billion—comparable to the $1 trillion available in the US across the IRA and other federal and state packages. But there are challenges, of access, coherence and clarity. For example, manufacturing subsidies are split across the EU Innovation Fund, the European Investment Bank, InvestEU and other instruments. Companies are unsure where to go, to whom to speak and what form to complete to secure support and get projects off the ground. Compared with the easily accessible federal tax credits on offer in the US, providing clarity and certainty to industry and investors, European funding is a morass.

Discussions in the European Parliament have been partly motivated by the desire to provide easy-access funding. One proposal is to reroute revenues from the Emissions Trading Scheme, the carbon-pricing mechanism now supported by the CBAM. Member states however remain hesitant to rework the system and limit their spending choices. And challenges would remain around reporting and enforcement.

The discussion has therefore moved on to a potential European Sovereignty Fund—a new pot of money from member states. Once again, however, their preferences might diverge and, following several years of increased central funding in response to the pandemic and the energy crisis, there are doubts about the appetite for more.

The EU’s current suite of policies, including the CRMA and NZIA and wider initiatives around efficiency and recycling, can help make supply chains resilient, robust and sustainable. But questions remain as to whether EU policy-makers and financiers can resolve the uncertainty around funding for the next generation of European industry. Key to that will be delivering the mass market of renewables, electric vehicles and hydrogen to underpin the EU’s targets—domestic manufacturing will to a large extent follow.

If not, the EU risks staying stuck—with greater exposure to international shocks and a weakening manufacturing base.

Source: Social Europe