

TRUST AND TRADE-OFFS: HOW TO MANAGE EUROPE'S GREEN TECHNOLOGY DEPENDENCE ON CHINA

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SUMMARY

- “De-risking” is the guiding motif of the EU’s new approach to China, particularly in green technologies where Chinese companies are striving for full dominance.
- For Europe, these same industries are supposed to generate future prosperity, enable the green transition, and enhance security through greater energy independence.
- As economic growth, climate goals, and national security cannot all be maximally achieved together in these sectors, European policymakers need to weigh these up and decide which to prioritise, when, and how.
- Instead of individually using incentives and trade tools ad hoc, at random, and in insufficient doses, member states should revolutionise their approach with: a real push in political leadership, enhanced coordination at the EU level, and clear prioritisation backed up by credible arguments.
- Policymakers need to define politically where the risks are greatest and what constitutes a tolerable dependency, actively seek partners in the world to preserve competition, and communicate clearly about the necessary trade-offs.
- A key question for Europeans to ask immediately is whether they trust Chinese companies to form the backbone of Europe’s green transition. The answer will determine the options available to them.

Time to talk trade-offs

As the world moves ever more deeply into strategic competition between China and the advanced industrial economies of the West, Europeans have to reassess their approach to this shifting landscape. Washington and Beijing are making their own calculations about how they balance their national security with their economic interests – and their ties to one another. Each is using legislative, trade, and other tools as part of this competition. The European Union is acting too, but it is facing a specific set of challenges.

China's financial and material support for Moscow is fuelling the Russian war effort in Ukraine. Chinese industrial overcapacities are undermining the future competitiveness of important European economic sectors. China's dominance of the green technology supply chain means decisions made in Beijing affect the EU's ability to pursue the energy transition.

At the same time, the EU's legal commitment – and public pressure within the bloc – to tackle the climate crisis is stronger than in either the United States or China, making it harder for European policymakers to resile from climate action. The EU's deep integration into the global economy and the way its wealth is built on global trade means the bloc is less well equipped to follow a protectionist, or even isolationist, path. And Europeans are facing severe fiscal constraints due to Russia's military aggression.

European leaders have adopted “de-risking” as their new mantra for this diverse set of challenges. But the term masks the complexity it purports to address. Leaders have a long way to go to transform de-risking into concrete actions that command broad support and deliver solid results.

This policy brief aims to elevate the level of this crucial debate. It assumes that the three vital dimensions of this issue – economic prosperity, climate action, and national security – all matter for democratic societies in Europe, and it zeroes in on the types of decisions policymakers will need to consider in the near future. It identifies the ‘China factor’ in three green industries – solar panels, batteries, and electric vehicles – and proposes scenarios whereby European leaders decide to ‘Do everything’, ‘Do something’, or ‘Do nothing’ in the face of potential Chinese dominance in each industry. The scenarios sketch out options available to the EU and member states and attempt to display the trade-offs.

Making sense of de-risking

China has secured an increasingly dominant position in established economic sectors and

emerging green industries. The Chinese leadership has defined the “new three” (新三样) – solar cells, lithium ion batteries, and electric vehicles (as opposed to the old three of household appliances, furniture, and clothing) – as the core drivers of China’s economic growth. It has massively expanded its industrial capacity in these areas. This growth creates risks for European economic competitiveness, national security, energy security, and even for the EU’s climate goals.

In the solar photovoltaic industry – a sector once pioneered by European firms – China’s capacity is now peerless in terms of the speed and scale of production and the affordability of prices, which no other global competitor can match. In the battery industry, Chinese companies have been extremely effective in sourcing rare earths from across the world and have a commanding hold over access to these resources and the scale of production, both of intermediary inputs and the completed batteries. And the electric vehicle industry has emerged as the latest and most contentious ‘green’ economic battleground, with Chinese manufacturers beginning to push into the European market in full force.

The automotive industry remains a cornerstone of Europe’s economic ecosystem, not least in comparison to the remnants of the European solar industry and a battery industry that never really got off the ground in terms of global market shares in the EU. Carmakers directly and indirectly employ 13.8 million Europeans and make up 6.1 per cent of total EU employment. Electric vehicles will be more than just cars; they will be at the nexus for innovation from robotics to automation to artificial intelligence, sensing, and human-machine interaction. Losing ground in this industry will be more consequential than in others. Highly subsidised Chinese manufacturers have begun outcompeting European legacy car companies in electric vehicles, which are the industry’s most important future growth area. Crucially, Chinese firms beat their European competitors not only on cost, but increasingly also on quality. In terms of global exports, Chinese battery and electric vehicle manufacturer BYD surpassed Tesla for the first time in the final quarter of 2023.

While Chinese electric vehicles’ market share is still relatively small in Europe, the trajectory is clear. European policymakers need to address the national security, economic prosperity, and climate implications of accepting Chinese dominance in these sectors – because dominance is Beijing’s goal. This is not only the stated aim of the Chinese leadership, but has long been amply evidenced in other sectors.

However, policymakers in European capitals have so far not spelled out a focus on China. “Actor-agnostic”; “non-discriminatory”; “industry-led”: the policy terminology they have reached for in the past was a way to avoid confronting the China challenge head on, and it grew from a fear of harming relations with Beijing. This reasoning is grounded in experience.

Since 2017, at the outset of the second term of Xi Jinping, the Chinese leadership has increasingly (ab-)used trade relations in pursuit of political aims. China's toolkit now includes instruments such as economic coercion, weaponising trade by abruptly imposing import restrictions, and introducing consumer boycotts, export embargoes, and non-tariff barriers. At the same time, the ever more highly connected nature of many modern products – including the new three – means that cyber security is now critical.

EU policymakers have responded. In recent years, the bloc has adopted the forced labour regulation, created the International Procurement Instrument, introduced the foreign subsidies regulation, revised its foreign direct investment screening process, opened anti-subsidy probes, passed the Critical Raw Materials Act, and agreed the Green Deal Industrial Plan with the newly passed Net Zero Industry Act at its core. On the surface, therefore, the EU appears ready to mobilise its economic resources to deliver on climate action and protect economic stability and national security.

Alongside these emerging measures, the EU's leadership has proposed de-risking as the strategic paradigm to guide its relations with China. This gained prominence in March 2023 after European Commission president Ursula von der Leyen called for Europe to “de-risk, not decouple” from China. European leaders have since taken up the phrase as they attempt to outline a new relationship with Beijing. So too has the Biden administration in describing its own approach to China. Yet the EU is still only just beginning to make sense of the policy choices that de-risking will encompass.

European policymakers appear to have intended de-risking to be a strategic, non-confrontational approach to integrating national security questions into economic policy. They have also tried to sell climate considerations as the magic fix to the broader ‘positive and collaborative agenda’. The term implies the alleviation of risks while avoiding a hard break. It has an aura of ‘reasonableness’ in contrast to the competing idea of “decoupling”, which implies more drastic change.

But the processes described as de-risking will inevitably involve a highly dynamic approach to risk management, assessing different sets of risk exposures under complex conditions with multiple, constantly moving variables. Decisions about the (re)allocation of political and economic resources to enhance security will invariably come with other costs and trade-offs. In setting out to reduce the risk in their relations with China, Europeans must assess all three sides of a triangle that contains security, economic, and climate risks. Shrink the exposure along one side of the triangle, and risks will grow along another side. At the same time, getting the de-risking geometry right will also mean understanding the impact of EU decisions on third countries. The United States' Inflation Reduction Act (IRA) is a useful test case here.

If it becomes a lot easier and more attractive to produce in the US, why import from India? Or Indonesia? If the EU decides to fully embrace Chinese market dominance in certain industries, other players will have an equally hard time competing globally if this effectively shuts them out of the European market.

The trust question

The matrices provided in the scenarios are an attempt to help advance the political conversation on de-risking and demonstrate the complexity of the trade-offs involved. They display some of the consequences of certain policy choices in each sector examined.

Under the current geopolitical circumstances, however, the first question for European policymakers to ask is: Do we trust Chinese companies – which are inherently interlinked with the Chinese Communist Party because of the structure of the Chinese political and legal system – to form the backbone of our green and digital transitions? The different possible answers to this question lead to diverging paths for European climate action and the EU's economic and industrial future.

Yes, we trust Chinese companies to form the backbone of our green transition

If the political answer to the trust question is generally “**Yes**”, then Europeans should shape policy choices that accept greater dependence on Chinese products. They would do so confident in the knowledge that they will reap the benefits of low consumer prices and gain a quick, clear route towards the green transition. Within this framework of trust, policymakers would need to find ways to mitigate the downside risks of severe dependence and, by extension, great susceptibility to economic coercion, cybersecurity vulnerability, and loss of competitiveness of Europe's own green technology industry. But they would already have taken the primary decision to embrace, and where possible capitalise on, these dependencies on Chinese companies. They would use the available resources to invest in research and development for future innovation and support the green transition with the help of Chinese technologies.

For the three industries studied here, this would mean choosing to ‘Do nothing’ at all on solar panels and batteries. It would involve letting market forces battle it out while financially supporting only these products’ rapid adoption – agnostic about product origins – and directing other resources towards global climate mitigation measures rather than Europe-focused industrial policy measures. For electric vehicles, such a positioning would imply that

decision-makers agree merely to ‘Do something’ with regard to incentivising Chinese companies to produce in Europe. This would be to hedge against job losses in Chinese-owned and Chinese-controlled car companies that manufacture in Europe, while trying to provide a broad regulatory framework that governs the flow of data from connected vehicles.

No, we do not trust Chinese companies to be at the heart of our green transition

If the political answer to the trust question is “**No**”, any de-risking strategy has to focus on minimising the exposure to China in the green technology sector as much as possible while ramping up alternative capacity. Policymakers would need to draw on all possible resources to do so – even if it comes at the cost of (at least temporarily) higher consumer prices or a slower (but perhaps in the long run more sustainable) achievement of climate goals.

Consequently, European leaders would need to impose high tariffs on Chinese products to protect existing industries in Europe and build new supply chains both in Europe and among friendly third countries. This would imply doing everything they can in all three sectors covered in this paper, from restricting Chinese solar panels as quickly as possible to banning Chinese batteries and the electric vehicles they power.

Additionally, diversification would have to operate on a whole new level, meaning the EU would have to conclude sectoral agreements with third countries such as India or Indonesia to enable alternatives to Chinese products. Policymakers would also have to assemble positive incentives for competition within the European green technology market. This could take the form, for example, of providing not only market access but also access to subsidies or tax credits to companies from the US, Japan, South Korea, India, Indonesia, Vietnam, and others with key players in these fields. They would also have to incentivise emerging economies to invest in manufacturing or the processing of raw materials by providing additional financing or underwriting risk and bringing down the cost of capital for these countries.

We do not trust Chinese companies, but ...

The answer to the trust question is likely a sophisticated “**No, but ...**” This means another set of conclusions follows. Under this logic, European policymakers would decide that they trust Chinese companies enough to embrace their role in less security-relevant areas such as solar panels (not necessarily inverters or other connected devices used in the production of solar energy) or existing electric vehicle batteries that currently have no connection to what in the future could be smart grids. They would then invest all available financial and political

resources in mitigating the challenges that connected technologies present, prioritising the most likely threats. While solar inverters are connected to the grid and create a high degree of vulnerability, any large-scale weaponisation would amount to an act of war and is thus less likely as a scenario. A risk management approach that looks to reduce the dependency on Chinese vendors over the course of three to five years might be a ‘good enough’ solution under current conditions. Indeed, a ‘good enough’ approach to the different industries could be a serviceable philosophy that allows a suite of actions to be quickly identified for implementation over different timescales.

In contrast, the potential to weaponise highly connected electric vehicles for political reasons – such as targeting specific individuals – carries a much sharper and more probable risk and is thus more urgent to mitigate. This surveillance and weaponisation potential grows ever greater as the density of such products increases in European markets. European policymakers could therefore direct their political energy to this area first.

An approach that looks into very specific technical risks is politically and technologically the most complex because difficult decisions have to be made for every existing and new technology, and done so under conditions of limited knowledge about the products on the part of the governments. This could amount to a bureaucratic checkmate where the technical analysis hampers timely decision-making. The political conclusion in this regard may thus also be that the administrative costs of trying to mitigate the risks associated with a specific green technology are too high; or the complexity of the regulatory and verification process is too great to be practical, leaving a full ban as the only option. For Chinese electric vehicles this could be a solution in the short term.

To operationalise this approach, a categorisation in threat assessments on a “to deal with in the next six months”, “to deal with in the next three years”, and “to deal with in the next 15 years” may help to guide decision-making and focus energies where the effect may be the greatest – from a national security, economic prosperity, and climate risk perspective.

For solar panels, this could mean doing nothing now, while over the course of the next three years investing in support for alternatives in the inverter industry and panel production capacity in third countries. In the next 15 years this could mean focusing on investing in innovation while fostering the creation of multiple production hubs around the world.

For batteries, this could mean immediately – albeit temporarily – incentivising Chinese production in Europe, using strict input diversification criteria, while over the course of the next three years investing in research and development for domestic capacity and in production in third countries. With an eye on future technological developments and grid

integration, this could prepare the EU to phase down Chinese supply in Europe over the course of the next 15 years.

For electric vehicles, this could mean immediately imposing significant tariffs that have a real market effect while conducting a full risk assessment, creating transparency requirements, and pushing the European Commission's nascent trustworthiness agenda at the G7 level as well as blocking investments by Chinese companies in the EU. Over the next three years, it would also require EU member states to jointly invest massively in a diversified supply chain and to create a subsidy scheme for all producers that adhere to trustworthiness standards at the EU level. In the long run this could help Europeans not only regain a competitive edge in the electric vehicle industry, but also contribute to competition globally for the rapid, sustainable decarbonisation of the mobility sector.

Decision time

EU leaders have long talked of building European sovereignty, and they have indeed taken steps to strengthen the bloc as a geopolitical entity. Yet the strategic competition between China and the West is becoming ever sharper, ever more quickly. The only way for Europeans to keep up now is to define their own rules, use their market power, and generate political will and support by taking an assertive stance and an inclusive approach on the critical questions confronting them in green technology industries. Naturally, there will be varying degrees of risk tolerance and trust within Europe vis-à-vis China. Clearly spelling out all the risk calculations is the very first step to managing them. The question of the level of tolerance within European societies with regard to the different dimensions of risk is something only elected politicians can truly decide as they navigate the tricky terrain ahead and attempt to build consensus. The visualisation of trade-offs presented in the following sections aims to create greater transparency around these risks. As the kernel of vital public communication about these challenges, this should also help avoid populist hijacking of the conversation by parties at the political fringes.

Green technology risks

Economic dimension	Supply chain risk	The degree to which the production of a finished product or component is imported from a single source.
	Competitiveness risk	The degree to which domestic European industries are threatened in their existence by competition from foreign industry in the relevant sector.
	Weaponisation risk	The degree to which the producing country can use dependencies to coerce a recipient country into a desired action.
Climate dimension	Climate risk	The degree to which de-risking policies contribute to or hinder emissions reductions and the realisation of the EU's decarbonisation goals by 2050.
Security dimension	Energy security risk	The degree to which the EU is dependent on technology, materials, or components to ensure its energy security.
	National security risk	The degree to which a particular industry or product involves access to sensitive data or critical infrastructure that constitute a threat to national security.

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The scenarios

The scenarios approach emerged following conversations and workshops held by the European Council on Foreign Relations with stakeholders – from green industry leaders to climate specialists, trade economists, China-watchers, and European and American policymakers. Fierce debates erupted among many of them when it came to the relative weight of their own area of expertise or investment in de-risking decisions.

The sections below open with an exploration of the current state of play in three crucial green industrial sectors. Each section then presents a range of scenarios that could play out in each

industry area – depending on how extensively European policymakers decide to intervene to reduce their risk exposure to Chinese decisions. Each scenario serves as archetypical example of possible policy decisions.

Solar panels

Importance to the EU

Reduced Russian oil supply since 2022 quickly raised demand across Europe for alternative sources of energy, including solar power. In 2023, solar comprised about 9 per cent of Europe's total electricity generation. But solar energy is becoming ever more important in the renewable sector, where it currently provides 17 per cent of Europe's total renewable energy production. In 2023, the total amount of newly installed solar capacity of 56 gigawatts (GW) was more than a third greater than in 2022. The EU's Solar Energy Strategy aims to scale up the bloc's total deployed solar capacity from 263GW today to almost 600GW by 2030. If it meets its goal, on some measures solar will become the EU's largest single source of energy production. Installation rates are already increasing rapidly; continuing this will mean it becomes crucial to maintain a stable supply of solar panels.

Dependence on China

The global supply chain for solar panels was once heterogeneous but is now dominated by China. In Europe, Chinese firms provide 90 per cent of the supply of solar photovoltaic modules. This represents a significant **supply chain risk**. Chinese companies also dominate the downstream supply chain, where they produce two-thirds of the world's polysilicon supply. Moreover, 40 per cent of global polysilicon manufacturing occurs are located in the Xinjiang province, which is a target of critics and regulators due to the prevalent use of forced labour and other human rights violations by the Chinese leadership against ethnic minorities. For Europeans this brings political risk for being complicit with Chinese practices by purchasing products from the region.

The **competitiveness risk** Chinese manufacturers pose for European solar photovoltaic firms is very high. The EU and other major players have been unable to match China's scaled-up production, which benefits from lower energy and labour costs and vertical integration along the supply chain. In 2023, production costs for solar modules in China shrank to \$0.15/W – compared \$0.30/W in Europe and \$0.40/W in the US. These collapsing prices have caused manufacturing capacity in Europe to decline markedly. Europe's share of polysilicon production is increasingly marginal. Wacker Chemie EG remains the sole European company among the global top five firms in this area and has large operations in China itself.

Europeans are not alone in this: north American and Asia-Pacific countries have also experienced a steep relative decline compared to China along the solar photovoltaic supply chain.

The EU imports many of the materials and components that it uses in solar module and cell production from China, Malaysia, and Vietnam. It is especially dependent on China for key components such as ingots and wafers. Furthermore, high levels of bankruptcy risk and low profitability are inherent to the solar industry, especially in the early stages of new projects; this discourages private investment. The EU aims to reach an indigenous production capacity of 30GW by 2030 across the whole supply chain. However, European manufacturers' cost-efficiency significantly lags behind that of their Chinese rivals, requiring significant investment of public resources to realise this goal.

As the significance of solar in the EU's energy mix grows, this high exposure to China bears a **weaponisation risk** that has consequences for **energy security** and **climate risks**. A disruption in supply, such as for geopolitical reasons, could hamper the EU's ability to keep pace with the rising demand for renewable electricity and the rollout of installations. That being said, there are ways to mitigate this risk, such as by stockpiling solar panels to deploy if supply disruptions occur.

In terms of the wider **national security risk**, including for cybersecurity, Chinese solar panels pose no greater problem than European modules. This is because these are mostly a 'dumb' technology. However, the risk to national security comes from inverters, which are the equipment that enable the energy generated by solar panels to be fed into power grids. As inverters connect individual households to national energy grids, they transmit and receive sensitive data on national electricity consumption. They can thus serve as an entry point for malicious incursions into smart grids, with the possibility to cause widespread blackouts. Among the top ten vendors of inverters are eight Chinese companies and two European companies (SMA and Power Electronics). Chinese firm Huawei is the leading vendor. Dependencies on China are higher for solar panels than they are for inverters, for which Europe already has a 60GW manufacturing capacity. Nevertheless, more than 60 per cent of new photovoltaic installations in Europe are equipped with Chinese inverters and Huawei's share alone stands at almost 30 per cent. However, this paper addresses only the risks associated with solar panels.

Current EU toolbox

The EU has several tools available to address the threat of Chinese over-dependency and reverse the decline of its solar industry. Firstly, its REPowerEU plan seeks to accelerate the

financing of the green transition and has close to €300 billion ready to spend in wind, solar, and other renewable sectors. Secondly, the EU's €40 billion Innovation Fund, fed by revenue generated through the EU emissions trading system, offers investments in next generation solar technologies such as thin-film solar cells and perovskites. Thirdly, the recently adopted Net Zero Industry Act will force member states to diversify their sources of solar panels as well as fast-track the permitting of new renewable projects, with a target of 40 per cent European manufacturing capacity of annual deployment needs by 2030. Lastly, a deal has been agreed with the European Parliament on the European Commission's proposed forced labour regulation. This will give member states three years to apply rules that will affect imports of photovoltaics or photovoltaic parts from China's Xinjiang region.

Third countries

The EU's goal to diversify the sources of its solar panel imports will create opportunities for new partnerships with emerging third country producers. Several countries are already actively seeking to build alternative manufacturing hubs or develop new solar technologies, endeavours which could benefit from European investment and research collaboration. Under President Joe Biden, the US has attempted to boost its domestic solar sector through the IRA, which offers a 30 per cent tax credit for solar projects. Japan, meanwhile, is investing in thin-film solar technologies to restore its edge in the industry, opening the door for research collaboration for next generation solar panels. Meanwhile, India's solar photovoltaic production capacity is set to reach 110GW by 2026, propelled by the government's mix of fiscal incentives for domestic manufacturers and barriers to imports. Nonetheless, the country remains dependent on China for upstream components such as polysilicon, ingots and wafers, ancillaries, and photovoltaic machinery. In terms of global supply, China's low-cost production has generated a surplus in cells and modules, creating opportunities for emerging countries to access affordable solar panels, but at the same making it harder for them to set up their own solar supply chains.

Solar panels scenario 1: Do everything ... Ramp up domestic production

In this scenario, European policymakers adopt an ambitious – and expensive – industrial policy to build up a potent domestic industrial base for making solar photovoltaics and markedly reduce dependence on imports from China.

The result is that import dependencies decrease but at high cost for a product that has only limited national security risk. Europeans fail to strategically develop closer ties with the rest of the world through this sector and instead foster what is effectively a boutique industry that enjoys no competitive edge on global markets. Fiscal space shrinks for investment in research and development in other important green industries where Europe has a stronger competitive edge, including wind energy.

The actions

The EU decides to invest heavily to expand domestic production. It uses the REPowerEU plan to direct seed funding to new solar photovoltaic equipment and facilities, and follows this up with a 30 per cent manufacturing tax credit and electricity subsidies. This drives the expansion of wafer and ingot processing plants and cell and module developers and helps consolidate European producers of polysilicon. At estimated capital expenditure costs of around €120m/GW in polysilicon production, €55m/GW in ingot and wafer production, and €80m/GW in both cell and module production, the EU spends around €20 billion annually to close the production gap and reach the 70GW annual production capacity needed to achieve 600GW installed solar capacity by 2030 without using Chinese products at any step of the supply chain. Decision-makers allocate the majority of the REPowerEU plan's long-term €300 billion investment towards solar rather than wind, batteries, or hydropower. Meanwhile, member states accelerate the application of the forced labour ban after it passes in spring 2024 and transpose it into national legislation long before the 2027 deadline. This restricts European consumers from purchasing photovoltaics products made in the Xinjiang region from as early as 2025. The EU also reintroduces anti-dumping and anti-subsidy measures that apply to the remaining imports from China; this equalises the costs between European and Chinese products.

The trade-offs

The massive subsidies for European firms and entry barriers erected against Chinese photovoltaics significantly lower the **competitiveness risk** for European manufacturers. In the medium term, reshoring the solar supply chain alleviates the risk of supply disruptions from geopolitical or economic shocks. This thereby reduces the **national security** and **energy security risks**. It solves the bottleneck issue in polysilicon and increases the sustainability of the supply chain for producers and consumers. By investing in the domestic solar panel ecosystem, policymakers reduce the **supply chain risk** of imports from China for a significant section of its targeted 600GW solar capacity.

However, one of the principal drawbacks stems from the pre-existing price competitiveness gap between European and Chinese manufacturers, which is extreme. This forces European companies to ambitiously scale their production to compete with the efficiency of Chinese industry. But this is only achievable by sustaining substantial support through state aid. At the same time, although the reshoring of manufacturing creates some new employment along the supply chain, automation is key to driving costs down. This dampens job creation.

Meanwhile, in the service-heavy deployment phase, which has long benefited from a cheap supply of Chinese inputs, the higher prices of European-made photovoltaics leads to a slowdown in solar panel adoption despite the greater abundance of domestic supply. This aggravates Europe's **climate risk** by decelerating the electrification of the power sector.

Additionally, because the EU does everything it can to reshore production along the supply chain, alternative third country suppliers of inputs and solar panels, such as the US, India, Japan, and Indonesia, reap no benefit from the EU's investments.

Solar panels scenario 2: Do something ... Diversify and stockpile

In this scenario, European policymakers adopt a less maximalist de-risking approach. Instead of trying to completely reshore the solar supply chain to the EU through an expensive subsidy programme, they focus on working with friendly third countries to diversify imports of intermediate inputs and finished solar panels. They also build up a strategic domestic stockpile of solar photovoltaic modules.

The result is an approach that comes closest to the idea of 'de-risk and diversify' that says: 'Do a little bit, but not too much, and make friends along the way.' It comes at a cost, however, as it requires creating attractive market incentives for third countries – difficult in such a narrowly based industry. Putting together a larger package of market openings and preferential access for third countries could also meet opposition from domestic industries and become harder to square within existing global trading rules. The EU's chosen 'stockpile and diversify' measures alleviate some of the risks associated with supply chain risk and help it build new partnerships that create new supply of solar photovoltaics. But they do not fundamentally end the bloc's dependence on China for critical inputs and they have limited impact on European firms' competitiveness.

The actions

The European Commission recommends that member states mandate the maintenance of a solar panel stockpile equal to 30 per cent of their total deployment (in GW) in the EU. Similar to the Critical Raw Materials Act, the EU also sets a clear benchmark stating that 25 per cent of member states' total solar panel imports must come from non-Chinese suppliers. The

commission then shifts the Innovation Fund's financial means entirely towards research, development, and technology subsidies for developing next-generation solar panels, such as thin film and perovskites. Finally, the EU uses its Global Gateway infrastructure investment programme to actively build manufacturing capacity in India and Indonesia for panel production. This provides access to cheaper capital for solar producers in these countries and enables medium-term purchasing guarantees and the establishment of 'solar hubs' in Delhi and Jakarta that facilitate communication between European deployment companies and the new wave of manufacturers. Meanwhile, within the scope of the G7, EU countries and the EU itself strike deals with the US and Japan to support new suppliers for materials and components for the next five years to boost solar diversification in the upstream supply chain. The forced labour ban comes into effect, but member states interpret the three-year grace period generously, which allows Chinese manufacturers to continue to sell to the European market. The ban obliges most export-orientated production to move out of Xinjiang, but human rights violations in the region continue largely unabated.

The trade-offs

In this scenario, solar panels deployed in the EU continue to come from Chinese suppliers in the medium term. The EU's chosen mix of stockpiling, innovation, and import diversification creates resilience to any Chinese decision to cut off photovoltaic imports, such as in the case of geopolitical escalation. The **supply chain risk** remains high for the EU, but the bloc's measures significantly reduce the **weaponisation risk** – and by extension the **energy security risk** – as they enable the EU to scale up solar panel purchases from outside China. The stockpile adds to this resilience. Some calculations show that in the case of a complete and sudden halt to Chinese supply, the EU's current estimated stockpile of roughly 40 GW could potentially buy enough time for it to develop alternative manufacturing capacities and reduce potential supply disruptions to a less dramatic level. The official stockpile mandate ensures that this buffer, which had built up unintentionally through market forces, is strategically maintained over the medium and long term and scales with total solar deployment levels in the EU so that it always covers a year's worth of deployment.

In contrast to the previous scenario's dependence on heavy subsidies to keep the European solar industry competitive, this scenario drives up competition within the single market over the medium term. It does so through a combination of investing in domestic research and development and forging outward-looking partnerships that enable non-Chinese companies to gain market share in the EU. Such a strategy creates significant opportunities to strengthen the bloc's economic and diplomatic relations with third countries. European investment to establish and scale up solar industries in countries such as India and Indonesia goes some way towards repairing the diplomatic damage from the controversy around the EU's carbon

border adjustment mechanism. Nonetheless, the EU and its partners still face economic and political barriers to procuring and strengthening alternative supply chains to compete with the scale of China's operations. Dominance of Chinese supply in inputs remains a chokehold that Beijing makes the most of with aggressive pricing.

Solar panels scenario 3: Do nothing ... At least on solar

In this scenario, European policymakers opt for no market interventions – and effectively let Chinese producers gain virtually 100 per cent market share in solar panels in the EU. Rather than blocking Chinese products and reshoring manufacturing, the EU instead invests existing resources in wind energy and hydropower. It thereby offsets the risks emanating from the dependency on China in solar by developing greater capacity in sectors where European companies are still more competitive. European policymakers introduce strict measures to reduce market distortions linked to Chinese subsidies and overcapacities in wind and hydropower.

By scaling up wind and hydropower beyond current forecasts, European companies gain advantages of scale and become more competitive on global markets. Third countries selling solar panels have virtually no chance to compete against Chinese suppliers on the large European market. This further consolidates global solar panel production and drives up costs for those countries seeking greater independence from Chinese supply (such as the US).

The actions

The EU decides against protecting its remaining domestic solar industry. In contrast to solar, the wind and hydropower sectors in Europe offer the resources, technological leadership, and expertise in these areas to yield better returns on investment in these industries. The EU is already forecast to produce 262GW of extra wind energy capacity by 2030, while hydropower is estimated to generate a quarter of Europe's total power mix by 2050. To this end, the EU directs resources from REPowerEU, the Innovation Fund, and Global Gateway into developing competitive and diversified supply chains in wind and hydro. The bloc and its member states also provide tax credits, electricity subsidies, purchase guarantees, and seed capital for the manufacturing needed to ramp up production in these industries and fend off the rapidly expanding presence of Chinese producers in these sectors. The European Commission additionally introduces anti-dumping measures, investment screening, and revised security requirements that restrict Chinese imports and investments in these industries. This provides European companies with vital breathing space. European leaders reach a milestone political agreement to deploy the EU anti-coercion tool if China weaponises its now-complete dominance in solar for political reasons. This collective decision signals strong readiness to counter any attempt to choke European markets off from solar supply.

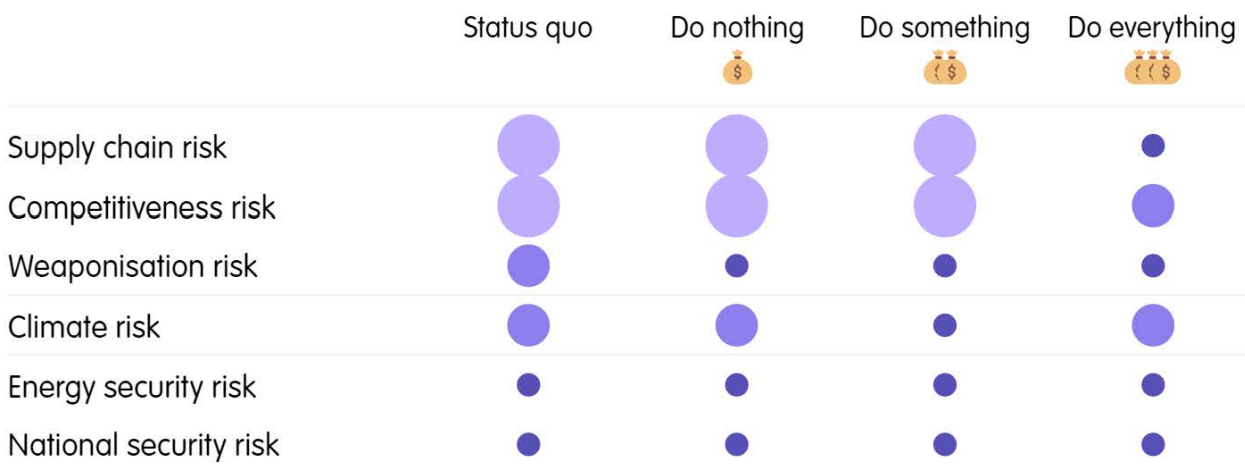
Finally, the EU still implements the forced labour regulation, giving member states three years to apply the rules. Almost all member states decide to take their time implementing the regulation. Chinese vendors make the most of this to adapt to the new rules by moving their polysilicon production destined for Europe out of Xinjiang and into neighbouring provinces, allowing them to continue to sell to the EU market without necessarily improving the human rights situation on the ground.

The trade-offs

The continued supply of cheap Chinese solar panels helps the EU reach its 600GW deployment goal by 2030 at the lowest price possible, reducing its **climate risk**. European policymakers in member states also avoid the high economic costs of onshoring the solar manufacturing supply chain integral to the most defensive scenario, although they have to spend some money to scale up alternative industries. Conversely, the **competitiveness risk** to the European solar industry remains so high that the sector cannot survive in any meaningful form. The **energy security risk** associated with the dependency on Chinese products is alleviated through investments and reshoring in wind and hydropower, scenario-planning for potential weaponisation, and EU coordination to ensure that those countries more dependent on solar in their energy mix are integrated into contingency planning.

Solar panels: Status quo and scenario risks

Solar panels Batteries Electric vehicles



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Batteries

Importance to the EU

The batteries industry is central to the EU's commitment to reach net zero by 2050. Batteries power the electric vehicles necessary for the bloc to reach its decarbonisation goals in the road transport sector, which accounts for 77 per cent of the EU's transport emissions and 20 per cent of its overall greenhouse gas emissions. Batteries are also required for the new grid storage facilities needed to enable the wider electrification of the economy, which will rely on intermittent renewable energy. As the share of renewable energy increases in the EU's energy

mix, the demand for energy storage capacity to satisfy flexibility requirements is expected to grow from 60GW currently (mostly in hydropower storage) to 200GW in 2030 and 600GW in 2050. Batteries are needed to provide the bulk of this storage capacity.

Dependence on China

Around 30 per cent of batteries in electric vehicles sold in the EU in 2023 were made by Chinese producers. Globally, at an average of \$126 per kilowatt hour, batteries were cheapest in China, with prices 11 per cent and 20 per cent higher in the US and the EU respectively. The lower prices are caused by massive industrial output in the Chinese market. In 2023, manufacturers in China produced 747 gigawatt hours (GWh) of battery power – more than the entire global demand for electric vehicle batteries of 706GWh, with only 387GWh of that total actually installed in products domestically. Chinese companies' experience with efficient production processes, along with their technological edge when it comes to the more energy-efficient and cheap lithium iron phosphate batteries, also contributes to these low prices.

Crucially, Chinese manufacturers dominate the entire upstream supply chain of battery manufacturing. Following years of investments in mining assets across the world, China controls around 41 per cent of the world's cobalt, 28 per cent of its lithium, and 78 per cent of its graphite, which is mostly mined in China directly. This dominance is even more pronounced in the processing of these minerals. Ninety-five per cent of manganese, 73 per cent of cobalt, 70 per cent of graphite, 67 per cent of lithium, and 63 per cent of nickel are refined at facilities located in China. Moreover, China produces 77 per cent of cathodes and 92 per cent of anodes, which are crucial intermediary inputs for battery cells. This dominance, above all else, poses a serious **supply chain risk** and choke-point for European battery manufacturers and consumers. It also means that the **risk of weaponisation** by China is potentially high in the case of geopolitical tensions or outright conflict. As battery storage becomes increasingly important for stability in electricity grids increasingly powered by intermittent renewable energy, this also has negative consequences for the EU's **energy security**. If there was a disruption to the supply of Chinese batteries or their inputs, which alternative manufacturers such as those from South Korea are dependent on, this could lead to a shortage of the batteries needed for sufficient grid storage.

The investment environment in the US has lately deteriorated for Chinese battery manufacturers, following the exclusion of batteries with Chinese inputs from IRA tax credits, a recent hike in tariffs, and continuing political uncertainty over even stricter measures. As a result, they are increasingly moving production to Europe, with \$17.5 billion of investments announced between 2018 and 2022. Slovakia recently welcomed its first foreign battery investment by Chinese Gotion High Tech and Hungary has attracted massive investment from

Chinese manufacturers, amounting to some €10 billion in the last year alone. Germany has also attracted investment and similar projects are planned in France and Spain. Chinese stakes in the European battery sector can bring opportunities to Europe in the form of jobs and potential technology transfer. But they also increase the risk of European and other third country manufacturers being pushed out of the European market, further increasing Europe's dependency on Chinese batteries.

Current EU toolbox

The EU has several framework initiatives in place to advance the European battery sector. One of the bloc's main roles is to provide strategic vision and targets for the industry. To that end, in 2017 the European Commission launched the European Battery Alliance, bringing together the commission itself, EU member states, industry, and the scientific community with the goal of making Europe a global leader in sustainable battery production. Using the expertise gathered in this forum, the European Commission adopted a strategic action plan for batteries, which set out six priority areas for strengthening Europe's battery supply chain, including access to raw materials, financial support for battery manufacturing in Europe, and research and innovation.

Over the years, the EU has adopted several regulatory tools to address some of the biggest challenges in reshoring the battery supply chain. The Critical Raw Materials Act sets 2030 domestic production goals for extraction, processing, and recycling and defines a ceiling of 65 per cent for the consumption of critical raw material that can be sourced from any one third country. It also aims to diversify imports of raw materials through partnerships with third countries, boosted by Global Gateway investment.

As a key technology listed in the EU's proposed Net Zero Industry Act, batteries play a central part in the bloc's Green Deal Industrial Plan. The batteries sector is set to benefit from eased regulatory barriers for new projects and public financing, for example through the Innovation Fund and the Recovery and Resilience Facility, which can provide grants and loan guarantees for both research and development and new manufacturing projects. The European Commission can also promote financing in the sector by relaxing usually strict single market state aid rules, as it did in 2023. This has, for example, allowed Germany to provide nearly €1 billion to Swedish battery manufacturer Northvolt to set up an electric vehicle battery plant in northern Germany; this figure represents around a third of the total investment sum.

Third countries

As in the solar industry, European attempts to diversify away from China across the supply chain have the potential to create positive synergies with third countries. There are investment and partnership opportunities in the mining and processing of the raw materials needed to make battery cells and their inputs. The EU could also seek to attract big non-Chinese players in the battery industry to set up shop in Europe. With a market share in Europe of around 60 per cent in 2023, South Korea is already the continent's largest supplier of batteries and operates factories in Poland and Hungary. An expansion of this sort of production capacity will not happen automatically, however. Incentives in the United States' IRA have already put at risk up to 68 per cent of planned European battery production, which could scale down or decamp to the US entirely, hurting EU competitiveness in the battery sector. With the EU's demand for electric vehicle and grid storage batteries rapidly accelerating, the EU is poised to become an attractive market for batteries. But it needs to provide incentives to also draw in manufacturing capacity from third countries or to build capacity elsewhere to diversify supply. Outside the EU, countries with good access to renewable energy, or to critical raw materials, are potential partners for a global battery industry that remains competitive against the backdrop of China's push for dominance.

Batteries scenario 1: Do everything ... Push Chinese players out

In this scenario, the EU and its member states use all tools available to them, including a new joint debt-funded investment mechanism, to replace Chinese lithium-ion batteries and upstream components in their electric vehicle supply chains and grid energy storage projects.

As a result, and fuelled by a massive subsidy programme, by 2030 Europe manages to supply all the batteries needed to satisfy its own demand for electric vehicle batteries, fed by more diversified sources of critical minerals and other inputs. This allows the EU to capture the battery industry's massive potential value and it creates up to 3 million jobs. Relations with third countries improve, as the bloc invests in mining and production facilities abroad. However, China will likely consider economic retaliation, fostering existing divisions within the EU.

The actions

The European Commission levies import tariffs of up to 40 per cent on Chinese batteries. This effectively blocks them from the European market. Alongside this defensive measure, EU member states agree to collectively shift into offence and establish a European Green Tech Sovereignty Fund, using joint debt to capitalise the fund with up to €350 billion. These steps

complement those already taken, including the establishment of REPowerEU. Decision-makers use this array of funds to create a mix of incentives in form of grants, loans, tax breaks, and guarantees for new battery cell manufacturing plants. They mobilise new investment in research and development to close the innovation gap with Chinese manufacturers. The European Commission also extends the relaxation of state aid rules beyond summer 2024, allowing individual member states to additionally use their own money to fund battery projects. By 2030, this allows Europe to produce 100 per cent of the battery supply needed for projected electric vehicle production at home, made both by European companies and those from like-minded countries such as Japan and South Korea. Companies from third countries are thus incentivised not only to stay but also to expand their operations in the European market. Chinese firms are excluded from receiving these subsidies based on joint criteria on trustworthiness and sustainability in supply chains agreed at the G7 level. As a consequence, they cease expanding their investments in the EU.

Using the Green Tech Sovereignty Fund, the EU also incentivises European cathode producers and lithium refiners to expand their production facilities within the bloc. This enables it to meet up to two-thirds of its cathode demand and more than half of its refined lithium demand by 2030. With the help of the Critical Raw Materials Act, the EU produces 10 per cent of the rapidly growing demand for lithium domestically, with supply coming from mines in locations such as Portugal and Serbia. To source the remaining lithium needed, the EU negotiates critical raw material partnerships with like-minded partners such as Australia, whose output currently accounts for almost half of global production, and other countries, including Mexico, Brazil, and Ghana, whose lithium industries are promising and growing rapidly. The EU directs its Global Gateway investments towards supporting battery industrialisation in these countries. It ensures a strict adherence to environmental, social, and governance (ESG) standards, which makes these investments significantly more attractive than competing Chinese offers.

The trade-offs

Although the EU continues to be dependent on imports of critical raw materials and other items needed to make batteries domestically, it significantly de-risks the upstream supply chain by diversifying away from China. This reduces the **supply chain risk**. What import dependencies remain are now much more dispersed, reducing their **weaponisation risk** by China, at least over the medium term. Rules for input diversification also drive down the single sourcing of critical components such as graphite.

Through these massive trade interventions and subsidies, the EU also begins to mitigate the **competition risk** it faces from Chinese battery suppliers and successfully captures the

massive potential economic value of this industry. It produces up to 1,200 GWh worth of battery capacity a year by 2030. This is enough to power the entire projected annual production of electric vehicles, creating up to 3 million jobs and capturing around €250 billion annually in economic value. In turn, this equips policymakers with the arguments to persuade the public of the economic benefits of a swift implementation of green industry transition policies.

On the downside, making nearly all of its batteries domestically means these become more expensive than Chinese imports, despite the large sums of money poured into the subsidy programme. Even with subsidies, setting up a new battery plant in Europe costs almost twice as much as it does in China. Batteries make up a significant portion of the total price of electric vehicles, which means that this European self-sufficiency has a significant knock-on effect on the cost of European electric vehicles, making them less affordable for much of the population and slowing the path towards achieving transport decarbonisation goals. This puts the EU in the same situation as the US; Washington already excluded electric vehicles containing Chinese battery components from eligibility for tax credits, introduced new requirements around the sourcing of materials to drive diversification, and restricted Chinese investments in production in the US.

Relations with third countries hold potential, as the EU provides ample funding to boost mining and manufacturing abroad, in a more sustainable manner than Chinese investors. However, there is also a significant political risk the EU needs to grapple with. After being essentially banned from the European market, China does not hesitate to push Chinese narratives that paint de-risking as trade protection in disguise. This gains traction in resource-rich third countries, worsening their opinion of Europe further. A Chinese complaint in the WTO further boosts the Chinese narrative that the EU only defends the international rules-based order when it suits its interests.

Given the drastic nature of the EU's new policies, China retaliates with punitive economic measures, imposing export controls on critical minerals, which severely constrain the European battery industry in the short term and actions in unrelated industries, such as luxury and agricultural goods. This impacts on different member states in different ways, fostering political division between and within European countries and pitting various interest groups against each other.

Batteries scenario 2: Do something ... Keep China in

In this scenario, the EU allows Chinese firms to operate but takes steps to help European firms compete, through targeted subsidies for European firms and diversified content requirements for

battery inputs.

The more limited financial measures are enough to ensure European firms' survival, although their Chinese rivals still manage to capture half of the European battery market. Attracted by higher subsidies in the US, third country producers from South Korea and Japan opt for the American market. Diversified content requirements ensure some degree of upstream diversification, but the lack of significant European investment means that Chinese investment in Europe moves in. The Chinese batteries that are produced in Europe create some jobs for Europeans, but labour standards disputes lead to friction and strikes. The risk of weaponisation remains but is lower, as it shifts from the mere potential to deny supply to the potential to divest and relocate, which is more costly for Chinese firms. Internal European competition for Chinese investments leads to political tensions within the EU.

The actions

The EU is unable to agree joint debt mechanisms to support domestic production, forcing the bloc to rely on existing instruments, which are financially more limited, such as the Innovation Fund, the Recovery and Resilience Facility, and REPowerEU. It also extends state aid rule exceptions beyond 2024. This falls significantly short of the sums needed for full autonomy in comparison to the first scenario. Member states are mostly left to fend for themselves in trying to attract battery investments while simultaneously attempting to diversify supply and build at least some domestic capacity. However, the EU also recognises there is a cost to removing Chinese firms entirely from battery supply chains in Europe and, with them, their leading position in cutting-edge battery technology and production processes. The bloc therefore decides to take a reshoring policy approach that does not exclude Chinese firms on trustworthiness or sustainability grounds. This enables Chinese firms to invest and build factories in Europe, although they are excluded from subsidy benefits on the grounds as they are already benefiting from subsidies in China. The EU and its member states attempt to counter Chinese dominance by specifically offering European and like-minded countries' companies subsidies from the available limited instruments to create fairer conditions at least within the European market (in a similar fashion to Germany's recent Northvolt investment). They also tie battery production investments in Europe to diversified content requirements, including for battery cells, refined lithium, and graphite in order to push back against further entrenching Chinese dominance on essential inputs in the battery supply chain.

Chinese greenfield investments in Europe rise further from the \$7.6 billion in 2023, focusing on battery production and other upstream inputs such as refined lithium, anodes, and cathodes. This brings in a steady – and more affordable – supply of batteries for Europe's electric vehicle industry. However, it also enables the effective import of know-how about

efficient battery production processes and new battery technologies such as the lithium iron phosphate battery, in which China currently enjoys a technological lead compared to its European and Asian competitors.

The trade-offs

The targeted subsidies for European and other non-Chinese producers ensure they initially survive against their Chinese rivals. Increased competition in the European market, including from Chinese firms, also spurs European companies on to innovate and improve production facilities. By the end of the decade, 50 per cent of European demand for batteries is satisfied by non-Chinese companies, with the other half covered by Chinese firms producing mostly in Europe. Although half of the economic value of the battery supply chain is captured by Chinese firms, the job creation effect in this scenario is similar to the ‘Do everything’ scenario, although more Europeans are employed by Chinese firms. However, this results in labour standards disputes similar to those already seen with recycling company SRW Metalfloat, which was taken over by Chinese owners and experienced one of the longest strikes in German history in a sign of what is likely to come with more Europeans employed by Chinese companies in Europe.

While diversified content requirement rules ensure that some upstream diversification takes place, significant dependencies remain in the inputs to the batteries produced in Europe by Chinese and European firms. These dependencies are still vulnerable to becoming weaponised to exert political pressure on Europe. However, the high amount of Chinese greenfield investment in Europe is double-edged. On the one hand, the potential sunk cost in these investments is a deterrent to Beijing to use economic coercion against European actors, as this would risk the EU retaliating by seizing assets. On the other hand, it is a geopolitical liability for Europe to be dependent on Chinese producers of batteries for half of its battery demand and a considerable amount of intermediary inputs. Chinese investments could also exacerbate existing political tensions within the EU as some member states, such as France, Germany, and Hungary, disproportionately profit from Chinese investments while others end up empty-handed. And lastly, the more Europeans are employed by Chinese companies, the more leverage Europeans lose in negotiations.

A further drawback in this scenario relates to third countries. Despite some subsidies and incentives, South Korean and Japanese battery makers do not double down on investments in Europe, where they face difficult Chinese competition. Instead, they opt for the American market, which offers even more attractive subsidies and a domestic market void of Chinese competition, leading their European market shares to shrink. The positive third market effect is thus less pronounced than in the ‘Do everything’ scenario.

Batteries scenario 3: Do nothing ... Embrace Chinese supply

In this scenario, the EU and its member states make a clear-cut political decision to let in cheap Chinese batteries in pursuit of the bloc’s ambitious net-zero goals.

As a result, without significant subsidy support, European battery manufacturers cannot compete with Chinese batteries and are mostly driven out of the market. Faced with fierce competition in Europe, South Korean and Japanese producers concentrate fully on the US market, leading to a near-total European dependency on Chinese-made batteries to drive the continent’s green transition. Cheaper Chinese batteries allow European manufacturers to offer lower-priced electric vehicles, accelerating their adoption. On the flipside, the weaponisation risk in case of geopolitical conflict remains very high and the EU misses out on partnerships with third countries.

The actions

The EU leaves tariffs untouched, which remain at the current level of just 1.3 per cent plus 2.7 per cent third country duty. Likewise, despite the entry into force of the new EU regulation on foreign direct investment screening, which mandates investigations into Chinese battery investments, member states ultimately choose to approve Chinese battery manufacturing projects in Europe. At the same time, the EU and member states do not adopt additional industrial policy instruments. This leaves financial support for battery manufacturing at around €3 billion per year. Such investment pales in comparison to the \$6 billion in annual support for battery supply chain diversification announced by South Korea until 2030, or the \$18.75 billion estimated IRA tax credits in the US until 2032, just for incentivising battery production in the US.

The trade-offs

The EU’s position impairs the European battery industry’s competitiveness vis-à-vis Chinese manufacturers in particular. Because they are effectively blocked from investing in the US and face no obstacles in the EU, Chinese battery producers increase their greenfield investments in manufacturing in Europe to capture as much market share as possible.

European companies cannot compete with the cheaper batteries and more effective manufacturing processes of Chinese firms, leading their market share to drop to 10 per cent by 2030, while that of Chinese manufacturers increases significantly.

Meanwhile, the comparatively small scale of financial incentives in the EU means that firms from like-minded battery producing countries, such as South Korea and Japan, move their planned investments from the EU to the US, where they benefit from much more attractive financial support. Conversely South Korean companies' market shares shrink from 60 per cent in 2023 to 20 per cent by the end of the decade, consolidating China's dominance on the European market.

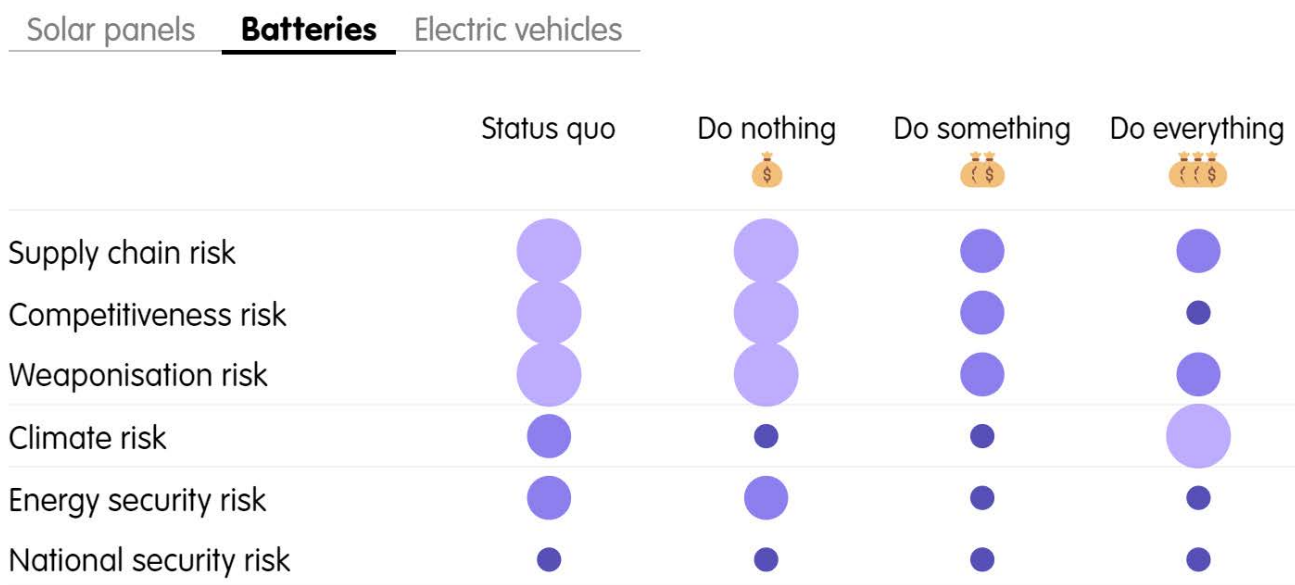
Investment by Chinese battery manufacturers in Europe creates new jobs, although their number remains lower than in other scenarios, as many job opportunities in the upstream supply chain activities – for example, in lithium refining and cathode manufacturing – stay in China. As European companies' market shares decrease, most value in the battery supply chain is captured by Chinese firms, which use the revenue to invest in innovation and research back home, further sharpening their competitive edge.

The EU's **supply chain risk** remains high, and with it the **weaponisation risk** in the event of geopolitical conflict. Even if the EU was able to seize Chinese production assets on European soil and keep them running, China's continued dominance in upstream activities means that it could strangle European supply in the medium term by imposing strict export restrictions on key battery inputs, as it has done in the past with graphite.

On the upside, a greater share of cheaper Chinese batteries helps the EU achieve its decarbonisation goals. As the battery makes up around 40 per cent of the total value of an electric vehicle, access to lower-cost Chinese inputs allows European automakers to reduce the cost of their models. This in turn enables them to compete with Chinese electric vehicles models on the European market. Cheap Chinese batteries also makes grid storage solutions more affordable and accelerates their adoption, contributing to the stability of Europe's increasingly decentralised grid.

Third countries and emerging markets remain very dependent on Chinese manufacturing and investment. As the EU fails to put serious money into mining and refining projects in emerging markets such as Mexico, Brazil, or Ghana, these countries miss out on alternative, ESG-compatible sources of funding. They continue to rely on Chinese investments to help them scale up their battery supply chains. As more and more third countries electrify their transport sector, Europeans continue to rely on Chinese-made batteries, increasing their vulnerability to weaponisation by China.

Batteries: Status quo and scenario risks



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Electric vehicles

Importance to the EU

The European Commission has an ambitious goal for at least 30m zero-emission cars on European roads by 2030. However, industry forecasts expect only around 8.4m fully electric vehicles in Europe by the end of the decade (around double the current cumulative stock of 4.7m vehicles). Passenger cars and motorcycles represent around two-thirds of total transport sector emissions, making their electrification disproportionately important for reaching the EU's transport sector decarbonisation goals. The EU has set a date of 2035 to ban the sale of internal combustion engine cars. Its plans to electrify personal transport mean the bloc is dependent on rapidly expanding supply in the next couple of years, especially of more generally affordable electric vehicles, outsourcing this element of the climate agenda to China can bear political risk.

Dependence on China

Even by the most conservative calculations, the EU's plans will create a massive new consumer market. Chinese electric vehicle manufacturers are already gearing up to capture as much of it as they can. In 2023, cars from Chinese brands such as BYD claimed 8.2 per cent of Europe's growing electric vehicle market, up significantly from a mere 0.5 per cent in 2019 and 3.9 per cent in 2021. Some estimates expect this to grow to 11 per cent in 2024 and even reach 20 per cent by 2027. If Chinese-made cars from Western brands are included, 1 in 4 electric vehicles sold in Europe will likely be imported from China this year.

State-led subsidies and investments in China have led to substantial overcapacities in the domestic Chinese electric vehicle market, with an estimated production surplus in 2023 of 5-10m vehicles, and potential to grow to 20m in 2025. Alongside other factors such as cheaper batteries, this domestic support allows Chinese manufacturers to offer significantly lower prices than their European competitors. For example, the BYD Seagull starts from as little as €10,200 – roughly half the price of even the cheapest current European car, such as the Dacia Spring. Cheap Chinese electric vehicles could help accelerate Europe’s electrification in the transport sector. But, given their subsidised low prices and rapidly improving quality, these cars also pose a formidable **competition risk** to the European auto industry, which, as already noted, directly and indirectly employs 13.8 million people. At the same time, European manufacturers increasingly produce electric vehicles within China, or are invested in joint ventures, which puts them in an awkward position of having to defend access for Chinese-made cars to the European market despite their shrinking market shares within China.

This economic risk is unlike the challenges seen in the 1970s, when new Japanese and South Korean carmakers began making their mark in Europe; the speed and scale of Chinese electric vehicles’ entry into global markets is unprecedented. And it is compounded by an entirely new type of risk unique to this next generation of vehicles: they are equipped with arrays of sensors that monitor the inside and surroundings of the car, collecting a treasure trove of sensitive data to train artificial intelligence and improve the performance of autonomous driving. This raises serious questions about the risk of espionage, targeted surveillance, and other cybersecurity threats.

Current EU toolbox

The EU has lately demonstrated a clear willingness to push back against Chinese dominance of the electric vehicle market, most notably with the European Commission’s autumn 2023 announcement of a probe into Chinese subsidies in the sector. Chinese companies have so far not complied with the EU’s demands for transparency around state aid along the supply chain. This non-compliance does not mean the investigation ends, but in fact makes it possible to impose even higher duties. Separately, the European Commission is set to introduce provisional duties in July 2024 to add to the existing level of 10 per cent tariffs on cars imported from China.

The European Commission has also announced it is looking into “the cybersecurity aspects of connected and automated vehicles – including Electric Vehicles” as a matter of priority. It is planning a risk assessment of these vehicles as part of this effort.

While the French car industry has been largely supportive of the French government's approach on pushing back against Chinese overcapacity in the electric vehicle sector, the German car industry is worried about the effect on its own sales within China and their export potential from China to Europe. As a result, the German chancellor has publicly spoken out against additional tariffs on imported Chinese cars.

Third countries

Manufacturers from non-EU countries play a particularly important role in this sector. While China's dominance of electric vehicles is rising fast, the automotive industries have traditionally been diversified between Europe, the US, Japan, and South Korea. Electric vehicles allow for even greater diversification and enable other countries to leapfrog the complex development of engines, and instead focus on design, software applications, and affordability. Indian electric vehicle manufacturers could also become highly relevant, and, notably, Vietnamese firm Vinfast has also entered the global market.

Chinese distortions and overcapacities are therefore not only a problem for legacy industry giants in the advanced industrial democracies – they pose an equally severe challenge to the emergence of alternative industries in emerging and developing economies. Yet this situation offers great potential for positive competition within the European market and globally. If China continues to push its electric vehicles onto the world market as aggressively as it has done so far, there will be very little space left for competition with China. The focus will be on intra-Chinese price wars, market consolidations, and competition between Chinese companies. This will also have an effect on car manufacturing in third countries, such as Morocco, where it has recently taken and which benefits in particular from significant French investment. If these companies in these countries cease to exist under pressure of Chinese competition, the automotive and parts industry will be dominated by Chinese companies far beyond Europe.

Electric vehicles scenario 1: Do everything...Slow down, dumb down, and ban

In this scenario, European policymakers mobilise all the regulatory and fiscal tools at their disposal to slow Chinese producers' expansion into the European electric vehicle market.

As a result, they keep Chinese electric vehicles out of Europe, thereby minimising the cybersecurity risk of targeted surveillance and maximising consumer data protection and transparency. While this reduces the competitiveness risk of Chinese electric vehicles to the European car industry, the EU's green transport transition slows as consumers lose access to cheap Chinese electric vehicles.

Asymmetric weaponisation risk remains high if Europe does not simultaneously address the battery supply chain. There is also significant political risk, as countries benefiting from Chinese investments, such as Hungary, threaten to block other EU policies.

The actions

As a first step, the EU explicitly lists electric vehicles in its NIS2 – cybersecurity – directive as a vulnerable, critical technology. Next, the European Commission initiates a fast-track risk assessment of the security implications of Chinese electric vehicles. It finds significant cyber and national security risks, including vulnerabilities to individual and systematic espionage, remote hacking, and data security. As a result, the commission introduces new technical requirements for electric vehicles; these revised requirements mean that Chinese companies exporting to Europe must comply with transparency rules on data storage and transfer, supervised under strict enforcement of the General Data Protection Regulation. Finally, the commission coordinates an investment screening system for member states. This mandates them to scrutinise all incoming Chinese investments in the electric vehicle sector for security risks, although it leaves the final decision with national authorities. Strict constraints are placed on investments in security-critical domestic industries. Chinese electric vehicles are excluded from government procurement on the grounds of the presence of Chinese cellular modules, which contain software processing and geolocation capabilities that pose an espionage risk. And coordinated action at member state level restricts such vehicles from entering military facilities and their vicinities, as well as other areas with critical infrastructure. Most EU member states agree to this, with the notable exception of Hungary, which refuses to back a joint approach and does not implement any decisions taken by the other EU members.

By summer 2024, the commission concludes its anti-subsidy probe and imposes an additional 50 per cent tariff on Chinese electric vehicle imports. In order to cushion negative impacts on its sustainable mobility goals, the EU provides generous subsidies to homegrown automotive industries to produce affordably priced models that cost less than €17,000, attempting to at least narrow the price gap with Chinese products. Through the Critical Raw Materials Act, the bloc expands its network of strategic partnerships with like-minded third countries and provides financial support to European producers to encourage investment in such friend-shoring destinations. The EU and the US sign a “pro-competition arrangement”, allowing European cars that meet IRA criteria to qualify for subsidies and vice versa. Japan and South Korea join the arrangement shortly afterwards, as does India only a few months later. The commission designates companies in such friendly countries as eligible for European subsidies on the basis that they contribute to a competitive and fair market. Additionally, the EU and the US coordinate on export controls regarding smart car systems, including sensor technology, which is often provided by American firms. These firms obtain improved access

to the European market but are no longer being able to sell to Chinese customers, limiting the potential of Chinese electric vehicles to process data with sophisticated AI sensors. This measure essentially dumbs down those Chinese electric vehicles already in the EU.

The trade-offs

The strong political will displayed by Europe to safeguard cybersecurity and reduce the **competitiveness risk** to its electric vehicle industry comes at the price of increased **climate risk**. These measures slow the mass rollout and adoption of electric vehicles in Europe, hampering progress towards the EU's ambitious decarbonisation goals by 2030 and 2050. Squashing Chinese competition – and with it the prospect of readily available, affordable, and high-quality electric vehicles – pushes up the average cost of electric vehicles in Europe. The large number of consumers who are looking for a car that costs less than €15,000 will have a strong incentive to opt again for a petrol or diesel vehicle. More affordable cars from South Korean or Japanese brands provide some reprieve in the short term, but they also become more expensive as they are prohibited from using cheaper Chinese-made inputs such as batteries if they want to profit from European subsidies.

There is significant political risk in this scenario. As the primary recipients of lucrative Chinese investments in battery manufacturing, and increasingly electric vehicle manufacturing too, Hungary and Slovakia are unwilling to support a tougher stance on Chinese foreign direct investment. They threaten to stall progress in other areas of EU policy – for example, on further assistance to Ukraine. The difficult relationship between the European Commission and Hungary deteriorates further.

Even though the EU manages to keep its **supply chain risk** in electric vehicles low, the **weaponisation risk** remains high, especially if the bloc does not pursue simultaneous action to diversify its battery supply chain. China retains a stranglehold over crucial battery inputs such as graphite, anodes, and cathodes, which significantly hurts European electric vehicle manufacturers after Beijing restricts the export of these materials to Europe and imposes higher tariffs. It also retaliates against European car companies within China, excluding them from research collaboration and introducing highly restrictive measures on their handling of Chinese data for automated driving training processes.

Despite these increased risks, the measures adopted successfully minimise the **cybersecurity risk** of targeted surveillance, including human rights violations against members of the Chinese diaspora living in Europe and large-scale data harvesting inherent in Chinese connected electric vehicles. By regulating early, the EU maximises consumer data protection and transparency. It averts a situation where the security risk becomes uncontrollable

because too many Chinese cars have already been sold and political leaders are afraid to deny consumers access to these vehicles.

Electric vehicles scenario 2: Do something...but nothing drastic

In this scenario, the EU struggles to coordinate policies among its member states. It therefore achieves only a minimal consensus on how to deal with the presence of Chinese electric vehicles in the European market.

The result is that Chinese electric vehicles quickly gain market share in the EU. Their availability and affordability contribute to the EU's transport sector climate goals. European carmakers struggle to compete, putting them under pressure to close factories. Some of the job losses are absorbed by Chinese manufacturers moving to Europe but labour rights and workplace culture issues arise. The lack of subsidies means other third country carmakers focus production and sales elsewhere. The EU is left with the security risk of a large number of Chinese electric vehicles on European roads; with every car sold it becomes more politically difficult to implement transparency and trust regulation.

The actions

Chinese electric vehicles enter Europe more quickly than the EU can deploy regulatory or fiscal instruments in response. The European Commission's anti-subsidy probe culminates in new tariffs of an additional 20 per cent on Chinese electric vehicle imports in the first quarter of 2025. However, this is insufficient to close the competition gap and only slightly slows European consumers' uptake of the new models. This hesitancy follows the emergence of a new pro-China bloc that forms after the 2024 European Parliament election and sabotages the commission's proposals to address the trust question. Policymakers argue that they have done something to address the problem, but it soon becomes clear it is too little, too late. Chinese companies also expand their investments in electric vehicle manufacturing in Europe. European policymakers are left to ponder how much market share they are comfortable conceding to Chinese companies, and whether they still have tools to limit the expansion.

The trade-offs

The EU's sustainable mobility goals benefit from the increased supply of cheap Chinese models, which allows consumers with less purchasing power to buy an electric car for the first time. This accelerates the bloc's overall share of electric vehicles and puts the bloc on track not only to reach the planned 30m fully electric vehicles by 2030, but also to meet its climate targets.

The **competitiveness risk** to European carmakers remains high. European companies

continue to lose market share, unable to compete with the unique cost and quality offer of Chinese electric vehicles. While European manufacturers continue their longstanding focus on designing larger and more expensive electric vehicles, Chinese manufacturers already offer more than 75 electric vehicle models that cost less than \$20,000, filling the gap in the lower-cost mass market left open by legacy European and US carmakers. In Germany, a wave of lay-offs in car factories leads to large-scale protests – demonstrating the high political risk in this scenario. However, as Chinese firms accelerate their efforts to open production sites in Europe and build new factories, some of these job losses are absorbed. While competition for this investment grows between member states, so do complaints about the kinds of jobs created by Chinese companies, whose management and hierarchical structures place heavy emphasis on automation. Unions become actively opposed to Chinese investments.

The EU quietly acquiesces to increased **security risk**. With many of the new vehicles already on the road, the decision-makers find it politically challenging to consider imposing measures that oblige Chinese firms to prove compliance with EU data security rules. China's leverage increases with every purchase. European policymakers are left to tolerate the Chinese government's possible access to economically valuable and security-relevant data and the dangerous potential of espionage inherent in this critical technology. They try to make a virtue out of the situation by signing sectoral data sharing agreements to satisfy the demand of European car manufacturers in China for data transfer from China to Europe.

Third countries – allies in the wider geopolitical competition with China and potential friend-shoring locations – are also impacted by the EU's halfway house approach. The lack of real subsidy incentives means that the EU fails to make a compelling offer to Japanese, South Korean, Vietnamese, and Indian carmakers to actively invest and seek market shares in the European market. Instead, European car companies provide their distribution networks to Chinese producers and enter into joint ventures – a sort of reversal of past approaches where Chinese companies needed the European joint venture partner more. This power balance thus changes fundamentally. Japanese and South Korean firms choose to focus on the US, both as a lucrative market and attractive production centre. Other emerging players in the electric vehicle industry, such as Vinfast and Tata, come under pressure in third markets, where they find it difficult to compete on price points with Chinese electric vehicles on global markets. They remain successful only in protected environments such as the Indian market, which already has a 100 per cent tariff on imported vehicles.

Electric vehicles scenario 3: Do nothing ... and embrace dependence

In this scenario, policymakers argue that now is not the time to challenge China geopolitically. Instead, they accept that China has built a comparative advantage in electric vehicles. They agree for

the EU to embrace the benefits for European consumers and decarbonisation goals.

As a result, the availability of cheap Chinese electric vehicles accelerates the EU's green transition in the transport sector. However, this is bought with a massive economic loss for Europe, as its car manufacturers lose competitiveness in their home market. This also entails very high national security risk for governments and individuals, as the potential for large-scale espionage, data theft, and individually targeted surveillance is severe. Third countries eschew the European market, unable to compete with the subsidised Chinese products.

The actions

The EU decides not to take on the Chinese electric vehicle industry. It redirects its available resources to sectors where it enjoys comparative advantages. This is at least in part determined by political turmoil after the 2024 European Parliament election and ongoing Russian advances in Ukraine, which persuade the European Commission to abandon its anti-subsidy probe and embrace a new China policy. The once-linear growth trajectory of Chinese brands in Europe changes becomes exponential, and their market share in electric vehicles surpasses 50 per cent by 2030.

Consumer uptake accelerates significantly due to the variety of cheaper options on the market. This helps the EU meet its transport sector climate targets. With over 10m electric vehicles on Europe's roads by 2030, adoption rates beat all the forecasts. The EU agrees provisions with Chinese firms that are supposed to force them to store all European consumer data locally in an attempt to at least provide some degree of protection to European consumers. However, as leverage shifts and market penetration rises, these rules are increasingly challenged, with Chinese firms arguing product safety can only be provided if the data is fully transferred and stored within China.

The trade-offs

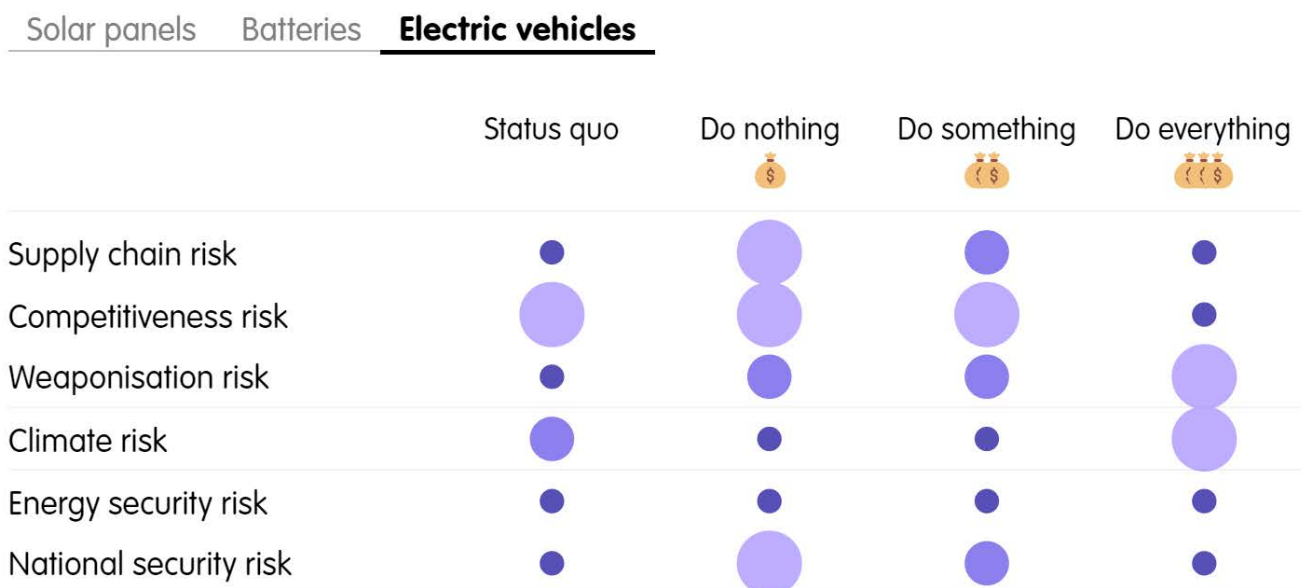
This acceleration in the EU mobility sector's green transition comes with substantial economic costs, as European manufacturers cannot compete with the onslaught of cheaper Chinese cars without government support in the form of subsidies or tariffs. Similar to the story of the solar industry, they are forced to downsize or close factories. Such major losses in a sector vital to Europe, not only in an economic sense but also an emotional one, poses significant political risk to European governments, especially in Germany and France. Therefore, while the EU advances towards its sustainable mobility goals, it does so while giving up on an important domestic industry that delivers green growth and fails to capture the immense prospective economic value in the electric vehicle industry. Policymakers

refocus their resources on alternative sectors, which provide other green growth drivers that can at least absorb some of these losses. They emphasise the potential of the wind sector and the development of smart grids.

The unconditional acceptance of Chinese electric cars on the European market contains a very high **national security risk** and **cybersecurity risk**. With nearly half of all electric vehicles in the EU now coming from companies with direct links to the Chinese Communist Party, and which can be forced under Chinese law to hand over data, the risk of broad and large-scale espionage, data theft, and individually targeted surveillance is severe.

Competitors from third countries outside Europe do not enter or expand their presence in the European market because they are now unable to compete with the subsidised Chinese products. Instead, they focus on the US, Japan, and India. Tata presents a €9,000 small passenger electric vehicle for the international market, which starts to gain traction in the emerging economies.

Electric vehicles: Status quo and scenario risks



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