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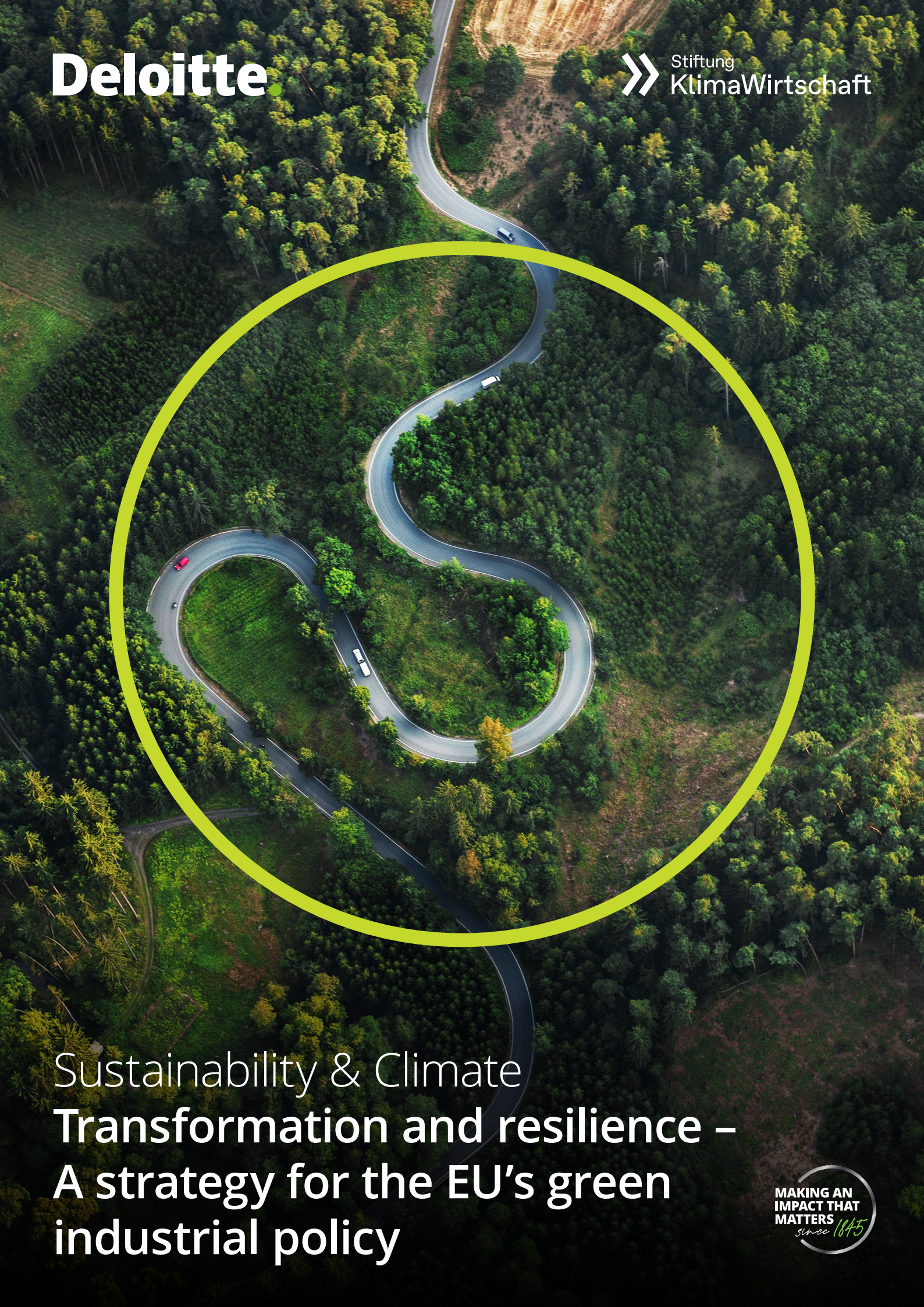

Sustainability & Climate

Transformation and resilience – A strategy for the EU's green industrial policy

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Stiftung KlimaWirtschaft — German CEO Alliance for Climate and Economy is a nonprofit foundation whose sole mission is to promote climate protection and the sustainable use of natural resources. As a CEO alliance of more than 30 companies from all sectors of business and industry, we work with government, think tanks and civil society to develop constructive solutions for the transition to a climate-neutral economy. As Foundation 2° we have been arguing for ambitious climate targets and ambitious climate policies at the national, European and international level since 2007. We renamed our foundation "Stiftung KlimaWirtschaft" in 2021 to better reflect who we are and how we work.

This study was commissioned by Stiftung KlimaWirtschaft. The arguments and positions presented here do not necessarily represent the views of Stiftung KlimaWirtschaft or its supporting companies.

Forwords

Dear reader,
The race to net-zero is in full swing. After years of smaller steps toward a climate neutral future, we're now entering a phase of great leaps. Cheap renewable energy is the foreboding of what is to come: transformation across all sectors, be it transport, industry or buildings. The transition is no longer a question of if, it's a question of when – and who will lead it. It is a race for international competitiveness and economic success – a race to achieve net-zero. And it is in full swing.

China is dominating supply chains for key technologies to build up the infrastructure for a climate neutral energy system. The US is catching up fast with the Inflation Reduction Act, having introduced a forceful, though expensive, programme to nurture clean industries at home. After years of leading the transition to climate neutrality, the European Union risks falling behind – just at a point when this very transition becomes the basis for economic prosperity and good jobs.

What the European Union is missing is a strong industrial policy supporting the shift to green energy and climate neutral industries. This policy must complement the Green Deal that has been implemented since 2019. Europe today has perhaps the strongest framework to set the entire block of 27 countries and 450 million citizens on the path to climate neutrality until 2050. What we need now is an ambitious industrial policy that enables businesses to invest in their transition, grow key cleantech industries and create good jobs.

This study, commissioned by Stiftung KlimaWirtschaft, shows European industrial policy so far has focused on leveling up economic development across the Union and ensuring a level playing field for the single market. We argue that in a period of forceful net-zero industrial policies implemented in the US and China, the European Union's model of industrial policy is no longer adequate. In order to serve the entire European economy, we need an industrial policy that actively invests and develops the net-zero industry in Europe – for Europe. As we look in the direction of the next European Commission's policy cycle, it is crucial that we shift the discussion towards what a future-proofed industrial policy needs to achieve, with what instruments it can be equipped, and how it can be financed. Businesses leaders, researchers and citizens in the EU are ready to take on the challenge of a global net-zero race.

I hope that this study gives you food for thought how to strive for a policy framework in Europe that truly supports and accelerates the transition, to create good jobs, build a dynamic, innovative and prosperous European Union in the 21st century and maintain a healthy planet for everyone. Enjoy the reading!

Yours faithfully,

Sabine Nallinger
Managing Director
Stiftung KlimaWirtschaft – German CEO Alliance for Climate and Economy

Dear reader,

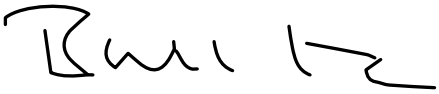
For long, the EU has been at the forefront of ambitious climate action. It has repeatedly adopted ambitious emission reduction targets to help curtail climate change over the last decades. In order to achieve these targets, it has pioneered the world's first mandatory emissions trading scheme as the key instrument for achieving its climate protection ambition, combining it with further measures to address an ever growing scope of emissions. And based on its advances domestically, it has sought to play an instructive and leading role in the international climate negotiations for a globally binding climate agreement and its successful implementation while working with partners from around the world for them to embark on a path of low-carbon and climate-resilient development.

With the adoption of the EU Green Deal in December 2019, the EU is again seeking to lead the world by example, aspiring to become the first climate-neutral continent and a resource-efficient economy by 2050. Since its inception, a plethora of policies and initiatives have been put forward to set Europe on a path to achieve this goal, addressing a multitude of sectors, topics and actors both within and outside the EU. In this context, green industrial policy has (re-) gained particular attention and emerged as a key ingredient to accelerate the transition to climate neutrality. The European Commission's Green Deal Industrial Plan (GDIP) of March 2023 outlines how the EU envisaged to ramp up its manufacturing capacities for critical technologies that are needed to reach its climate ambitions.

Just as this renewed focus on industrial policy as a means to facilitate the net-zero transition materializes, the EU's previous approach – a focus on cohesion policy to level living conditions across Europe and on carbon pricing (complemented with a range of focused expenditure measures) to drive the transformation of emission-intensive sectors of the economy – is called into question by range of geopolitical developments. For one, the US Inflation Reduction Act (IRA) offers an alternative approach to transformation based on comprehensive subsidies for green technologies that is drawing a lot of attention. In addition, the corona pandemic and substantial dependence on single suppliers of key commodities for the green transition coupled with fears such dependence could be exploited for economic or political reasons have shed light on the importance of the resilience of supply chains. This has also been seen with regard to energy supply and soaring energy prices in Europe in the wake of Russia's war against Ukraine.

Against this background, our study explores which direction the newly emerging green EU industrial policy should take: Should it follow the US IRA approach with massive spending to ramp up green value chains in Europe, or should it pursue a tailored and more nuanced approach to ensure the availability of critical technologies for the net-zero transition in Europe? In case of the latter, how might it look like, and how might the GDIP be further tweaked to support its own ambitions? In order to answer these questions, we put forward a new analytical framework aimed at identifying the most promising levers for a green industrial policy in Europe, and hope you join us in this important debate.

I hope you enjoy the read.



Prof. Dr. Bernhard Lorentz
Managing Partner
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Executive summary

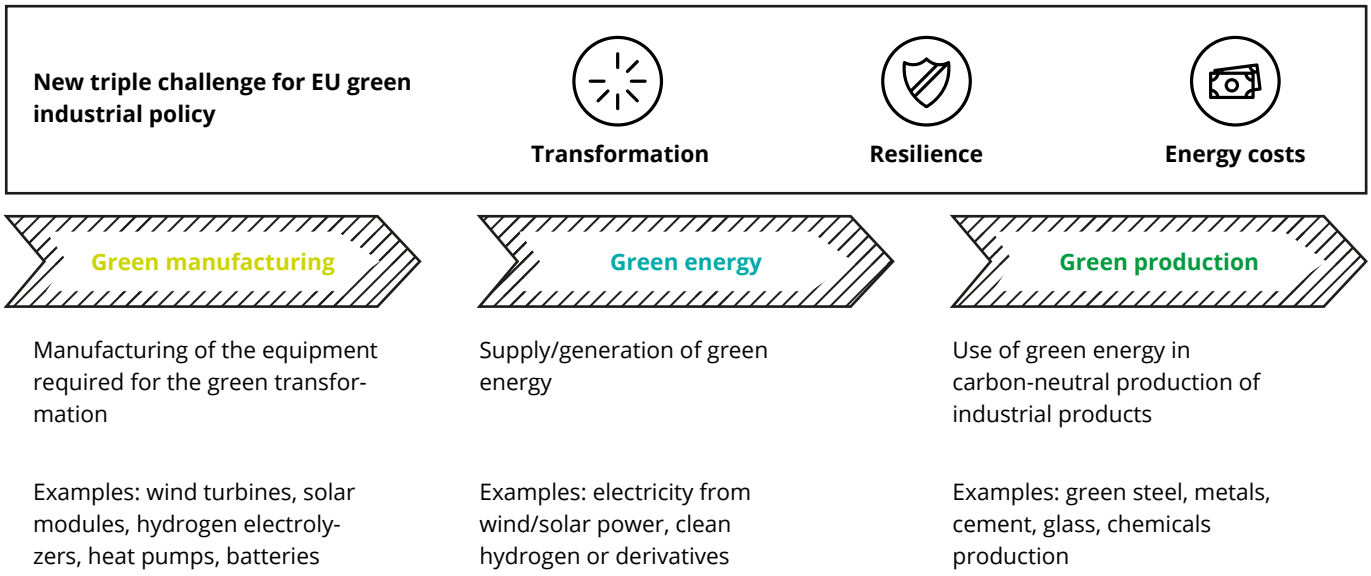
The US Inflation Reduction Act (IRA) exposed the need for a new green European Union (EU) industrial policy. After decades in which industrial policy was seen mainly as a threat to the internal market, the passing of the IRA in the USA has fueled the debate on the need for a new green EU industrial policy. The need for reinforced industrial policy has more origins than the IRA: The green transformation requires policy intervention to guide markets in this epochal task. New challenges have emerged in the geopolitical environment, including dependencies on and risks of their strategic usage by China.

The EU Commission's response should be further improved and elaborated. In particular, policy documents, including the Green Deal Industrial Plan (GDIP) and Net Zero Industry Act (NZIA), should be sharpened to coherently derive policy instruments from strategic objectives.

The triple challenge for the EU's green industrial policy

There is a triple challenge that EU green industrial policy must tackle: First, a challenge to its transformation approach as an increasing number of third countries base their transformation policies on subsidies rather than carbon pricing. Second, resilience: The EU needs to address critical value chains of investment goods for the green transformation to ensure price-effective access to these goods for the needs of its transformation in the critical decade until 2030. Third, energy costs: Presently high energy prices in the EU pose a danger to the survival of trade-exposed, energy-intensive value chains, before additional deployment of renewable energy will contribute to lower costs for energy in the EU.

Fig. 1 – The triple challenge and the green value chain



Source: Deloitte

Green industrial policy should be developed and analyzed with respect to the green industrial value chain. We propose this concept of a macro-level value chain consists of three stages, green manufacturing (i.e., the manufacturing of the equipment required for the green transformation), green energy (i.e., the generation of renewable (green) energy), and green production (i.e., the production of industrial products using renewable (green) energy). In addressing the triple challenge, the key decision will be which value chain stages to target with appropriate measures for the specific challenges.

Can the IRA be a blueprint for an EU industrial policy?

The IRA pursues a value chain-based approach to industrial decarbonization, addressing all elements of the triple challenge with one simple main instrument: subsidies in the form of production tax credits along value chains within green manufacturing and green energy.
There is a clear difference between the structure of existing funding programs in the US and the EU. While the US provides broad funding for mature technologies and their market implementation in green manufacturing and green energy, the EU's existing funding programs focus on lower technology readiness levels across the entire green industrial value chain. Taking Germany as an example, more production-level support is offered in EU Member States, with a focus on green production and smaller-scale support for green manufacturing.

The IRA approach is not suitable for the EU: It is fiscally too risky as the instruments used are nominal rather than smart subsidies. In the complex brownfield situation in the EU, interactions with the many existing policy instruments would further increase this risk. Also, the tax credit instrument cannot be copied by the EU with 27 Member States with their own tax regimes. Finally, the IRA's value chain approach is unsuitable for the EU as it relies on a cascade of subsidies within the green manufacturing and green energy stages of the green industrial value chain. The latter should not be the focus of EU support measures, as it would likely discriminate against efficient and necessary imports of green energy. Focusing support on the green production stage instead inhibits the integrated IRA approach.

A differentiated EU green industrial policy approach

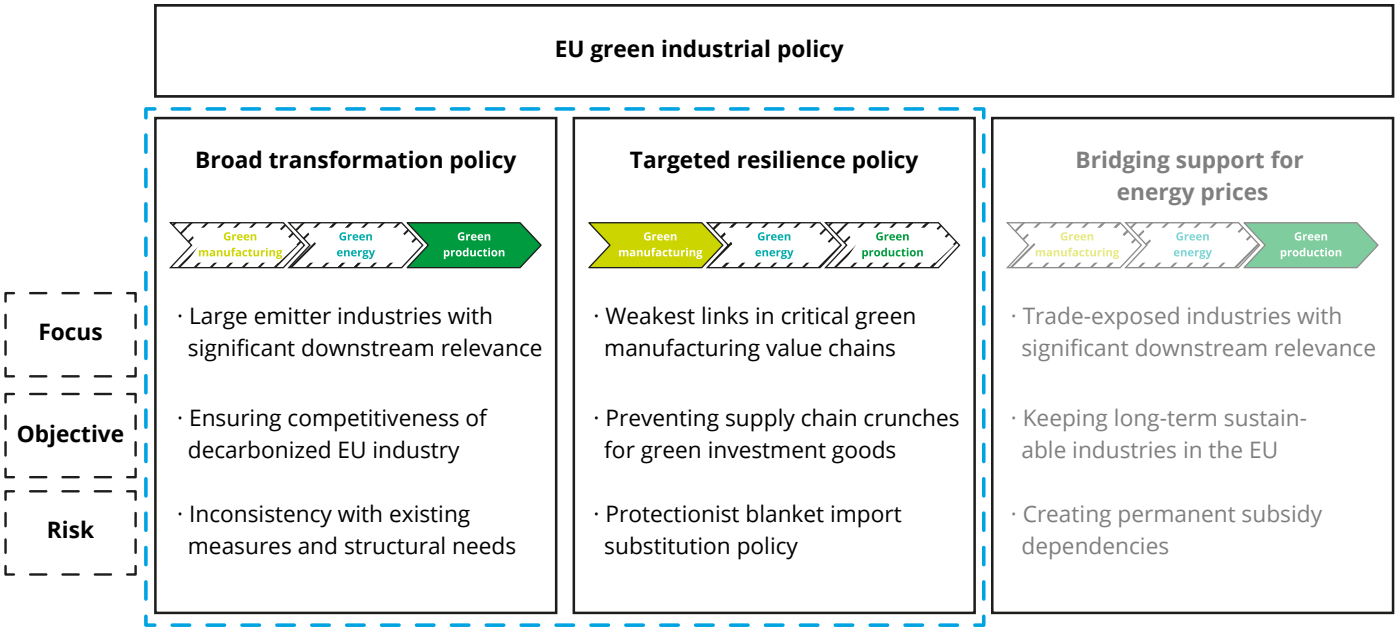
The IRA should be taken as a call to action for the EU to formulate its green industrial policy. While the IRA should not serve as a blueprint, it highlights gaps and deficits in the ongoing policy toolkit of the EU that should be closed with a new green industrial policy. The focus should be twofold: to regain the momentum as a global leader in green transformation policy, and to remedy the lack of an adequate resilience policy in the EU that the IRA has exposed.

A better EU response would be characterized by more simplicity of design and use while eschewing protectionist reflexes. While the GDIP and NZIA mention most of the keywords of the debate, their direction and strategic thrust is reduced by mentioning too many unrelated instruments at EU and Member State levels. The focus should lie on more action at EU level. Facilitating actions by Member States by relaxing state aid rules may be politically easier but leads to more fragmentation of the policy landscape and poses dangers for the EU's internal market. Smart instruments should be availed to safeguard efficient use of funds, but their design needs to emphasize simplicity of use.

The policy response to the IRA should consist of two main arms and should be implemented through a revision of the GDIP and its ancillary documents: First, a broad transformation policy and second, a targeted resilience policy.

Bridging support for energy prices should be given serious consideration. This policy is not analyzed in detail in this paper as it is not an element of the EU response to the IRA, but not addressing the energy price challenge could endanger ongoing transformation in industry and lead to serious repercussions throughout further value chains with substantial losses of EU output. To limit the fiscal implications and the distortion of energy markets, any such support would need to be very carefully targeted to energy-intensive production with large downstream significance in trade-exposed value chains.

Fig. 2 – Coherent EU policy mix as the answer to the triple challenge



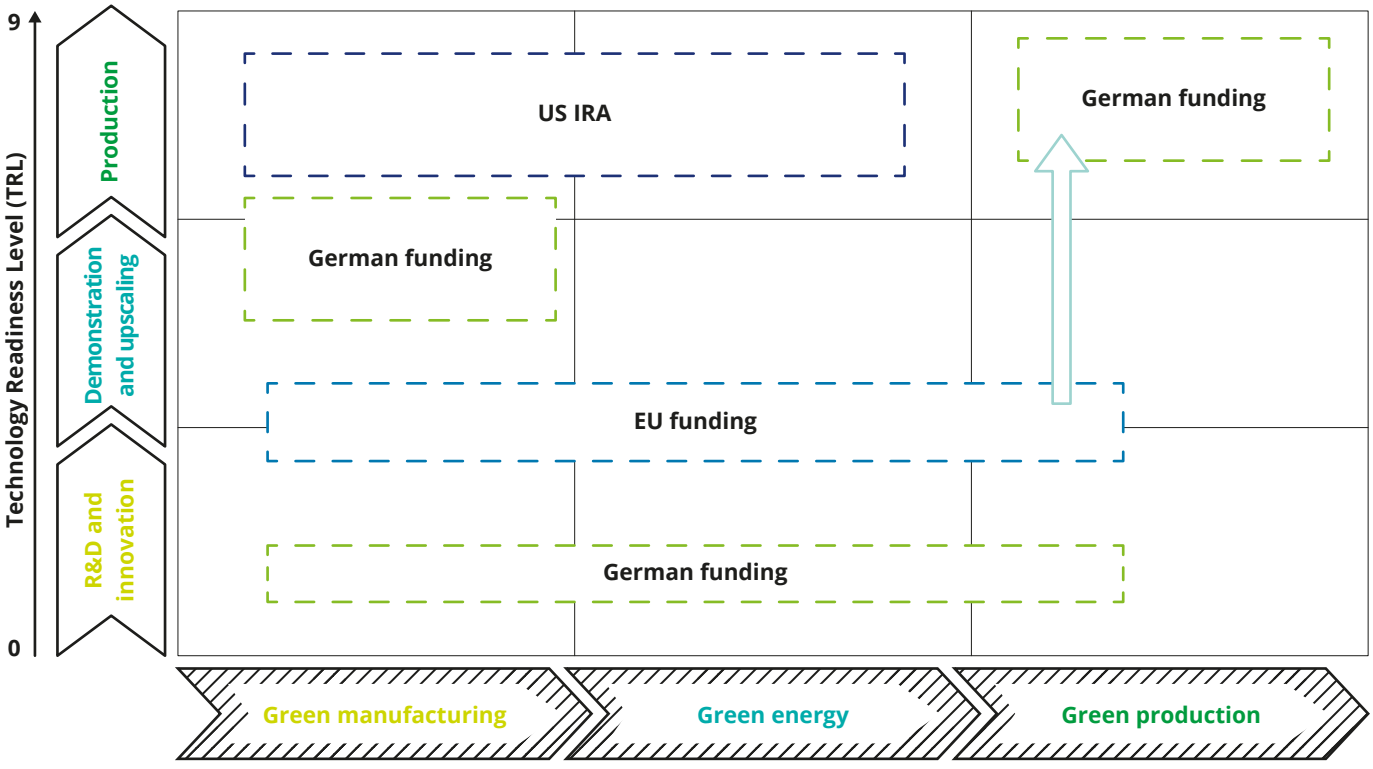
Source: Deloitte

A broad EU transformation policy

The broad transformation policy should be a response to the challenge to the EU's transformation approach brought about by subsidy-based approaches in other countries that make green production cheap, rather than fossil-based production expensive. For that task, the centerpiece of the policy should be an EU-level funding instrument providing support for the highest technology readiness level production and market entry. To avoid problematic interactions with existing instruments at EU and Member State level, this instrument should address the green production stage of the green industrial value chain.

An EU Carbon Contracts for Difference (CCfD) scheme similar to the one presently under development in Germany should be considered as an attractive instrument of choice, as it unites all the desirable characteristics for the central instrument of the broad decarbonization policy: It is a smart, market-based instrument that is consistent with the EU Emissions Trading Scheme (ETS), it can be designed to support green production, and it is able to support both CAPEX and OPEX, the latter being needed to incentivize transformation relying on higher cost energy inputs. Moreover, it can be designed to ensure that only projects that will be economically viable without financial support at the end of the program are supported. It will also provide a push for technological learning in important new technologies and for the development of new markets for green products.

Fig. 3 – Need for development of EU transformation funding



Source: Deloitte

The CCfD scheme should address the hard-to-abate sectors with significant downstream relevance. This focus helps avoid a cascade of subsidies along a value chain that will likely lead to excess subsidies while contributing to both the environmental and the economic components of the transformation objective. The scheme should be set up as an EU program. Despite political obstacles, an EU program designed with simplicity should be set up and funding provided by increased EU budget contributions of Member States, EU debt or increased allocation of ETS revenues to the EU budget. An EU-harmonized approach funded by Member States would be a much less desirable second-best choice.

The CCfD scheme should be accompanied by further instruments. First, an ongoing push to develop critical infrastructures including electricity, hydrogen and rail grids as well as digital infrastructures as the green transformation requires massive increases in infrastructure investment. Second, efforts towards establishing "green lead markets" for products incorporating base materials from green production would be helpful as they will reduce the financial support requirements for subsequent investments in green production.

A targeted EU resilience policy

The aim of the targeted resilience policy should be to ensure the reliable availability at affordable prices of the critical investment goods required for the green transformation of the EU's industry in the crucial ongoing decade until 2030: Resilience in critical supply chains, by which we understand especially the equipment for solar and wind power generation, production of batteries, heat pumps and electrolyzers, is currently endangered by the risks of a global supply shortfall during the huge ramp-up of production capacities required during the decade and by the risk that single suppliers of critical goods, especially China, may use their dominant positions strategically for political gain.

A resilience policy should avoid the protectionism exhibited in the current draft of the NZIA: The goals for EU production capacity in the NZIA amount to a call for a protectionist import substitution policy, which could lead to a large increase of the cost of the EU's industrial transformation. Instead, the benefits of free trade with a diversified set of reliable partners should be harnessed, combined with a response to unfair distortions of competition by foreign subsidies and ensuring minimum production capability in the EU to maintain technological sovereignty in critical technologies.

The targeted resilience policy should address the weakest links within green manufacturing supply chains, based on a systematic risk assessment: Attention to individual stages of the supply chains is required to avoid missing out on vulnerabilities by only looking at final products. A systematic, data-driven risk assessment should be developed that separately considers two main dimensions of risk: worldwide supply risk as the ramp-up of global supply may fall short of global demand and dependency on a single supplier.

The results of the risk assessment and an evaluation of the competitiveness of EU production should guide the choice of policy instruments for the at-risk stages of supply chains: In case of single supplier dependency and uncompetitive EU production, instruments for increasing the diversification of the EU's imports such as partnerships, free trade agreements or capital cost support in third countries should be used. In the case of global supply risks and competitive EU production, instruments supporting more EU production should be used. The potential of less market-distorting measures such as stabilizing demand expectations, or regulatory facilitation should be exhausted first before moving to more distortive measures. In the other two combination cases, a mixture of instruments should be used. If a global supply risk and a single supplier dependency exist for the same value chain stage, the instrument choice should generally follow the global supply risk.

Stabilizing demand expectations and safeguarding minimum production capability in critical value chains are no-regret policies. Ensuring a consistent development of the green transformation in user sectors such as the deployment of renewable energies has not been successful in the past but could stabilize supply chain development in the EU. And supporting minimum production capacities in the EU would safeguard technological sovereignty in non-trivial parts of supply chains.

1. Introduction

The IRA exposed the need for a new EU green industrial policy

Industrial policy has recently returned to the center stage of policy – and has taken on a green hue. State intervention will be required to manage the epochal challenge of the green transition of economies towards net zero. At the same time, industrial policy is also required to improve the resilience of economies in an increasingly challenging international environment.

The European Union's (EU) green industrial policy is the subject of intense ongoing debate. Although an EU green industrial policy has effectively already been called for with the EU Green Deal[1] and subsequent strategies, the passing of the US Inflation Reduction Act (IRA) in summer 2022[2] exposed the need for a far more pronounced strategic approach of the EU, underpinned with the requisite instruments.

[1] European Commission (2019),), The European Green Deal, COM(2019) 640 final

[2] Other policy instruments of partner countries of the EU contributing equally to this need include the US Infrastructure Investment and Jobs Act, the US Chips and Science Act or the Japanese Green Transformation Bill.

The European Commission has reacted to this challenge with the Green Deal Industrial Plan (GDIP)[3] and drafts of key pieces of legislation, especially the Net Zero Industry Act (NZIA)[4] and the Critical Raw Materials Act (CRMA)[5]. But the current state of these plans and acts has been widely criticized[6]. As we argued in a previous study[7], current EU plans are fragmented and complex compared with the simplicity and clear strategic thrust of the IRA.

Needed: A clear strategic approach

While the existing Commission documents include all the keywords raised by the IRA, they would benefit from a stronger strategic approach, coherently deriving policy instruments from strategic objectives. It is here that this study intends to contribute.

The study attempts to shed light on how an EU green industrial policy should be properly structured and implemented through the lens of the IRA challenge. It is restricted to green industrial policy with a focus on policies relating to the manufacturing sector. It hence does not consider aspects related to the digital transition or critical raw materials, although it does acknowledge their importance.

Structure of the study

As any strategic approach must be derived from objectives, we start in section 2 by outlining the triple challenge that an EU green industrial policy should tackle. As this study looks at the issue through the lens of the IRA challenge, we ask the crucial question in section 3 of whether the EU should take the IRA as a blueprint or find a different response to it, by comparing the IRA approach with the existing structure of industrial and transformation policies in the EU. This leads to a proposal for a differentiated EU green industrial policy in section 4, showing that the EU approach should indeed differ from the IRA approach. Approaches and key instruments for the two most important arms of the EU's IRA response are outlined in the subsequent sections. A new, broad, and impactful transformation policy at EU level is outlined in section 5 and complemented by a targeted resilience policy, as outlined in section 6. The study reflects analysis by Deloitte experts and the practical insights of Stiftung KlimaWirtschaft and theindustrial companies supporting it.

[3] European Commission (2023), A Green Deal Industrial Plan for the Net-Zero Age, COM(2023) 62 final
[4] European Commission (2023), Net Zero Industry Act, COM(2023) 161 final
[5] European Commission (2023, European Critical Raw Materials Act, COM(2023) 160 final
[6] See e.g. Tagliapietra, Veugelers, Zettelmeyer (2023),), "Rebooting the European Union's Net Zero Industry Act", Bruegel Policy Brief or Jansen, Jäger and Redeker (2023), "), "For climate, profits, or resilience?? Why, where and how the EU should respond to the Inflation Reduction Act", Jacques Delors Centre Policy Brief
[7] Deloitte (2023),), "IRA and the net-zero race – How EU industrial policy should respond", https://www2.deloitte.com/content/dam/Deloitte/de/Documents/about-deloitte/Deloitte-EU-Green-Industrial-Policy-Study.pdf

2. The triple challenge for the EU's green industrial policy

A revival of industrial policy
Associated with the idea of "picking winners" – and all too often ending up supporting losers – industrial policy was in previous decades widely considered a dirigiste approach that was overly optimistic regarding the state's capability to influence business decisions for economic growth objectives. Recent years have seen a clear reversal of this trend.

Two realizations or changes in thinking underly this reversal:

1. The realization that the generational challenge of the transition towards a net-zero economy requires a green industrial policy for guidance, incentives and to overcome coordination problems.

2. A departure from the free-market and global free-trade narrative, in which industrial policy would mainly distort the efficient allocation driven by free markets and free trade.

The second realization was driven by two types of development: The shutdown of entire economies during Covid-19 exposed the vulnerability of complex global value chains relying on an exact clockwork mechanism of just-in-time deliveries for maximum efficiency. And increasing weaponization of economic policy as exhibited by Russia, especially since the start of its war against Ukraine, or the risk of strategic-political use of economic might as in the case of China, require that governments in the rest of the world find a response.

The revival of industrial policy hence requires intervention by the state to guide the green transformation, counter other countries' industrial policies and provide resilience against the vulnerabilities of economies in complex global value chains.

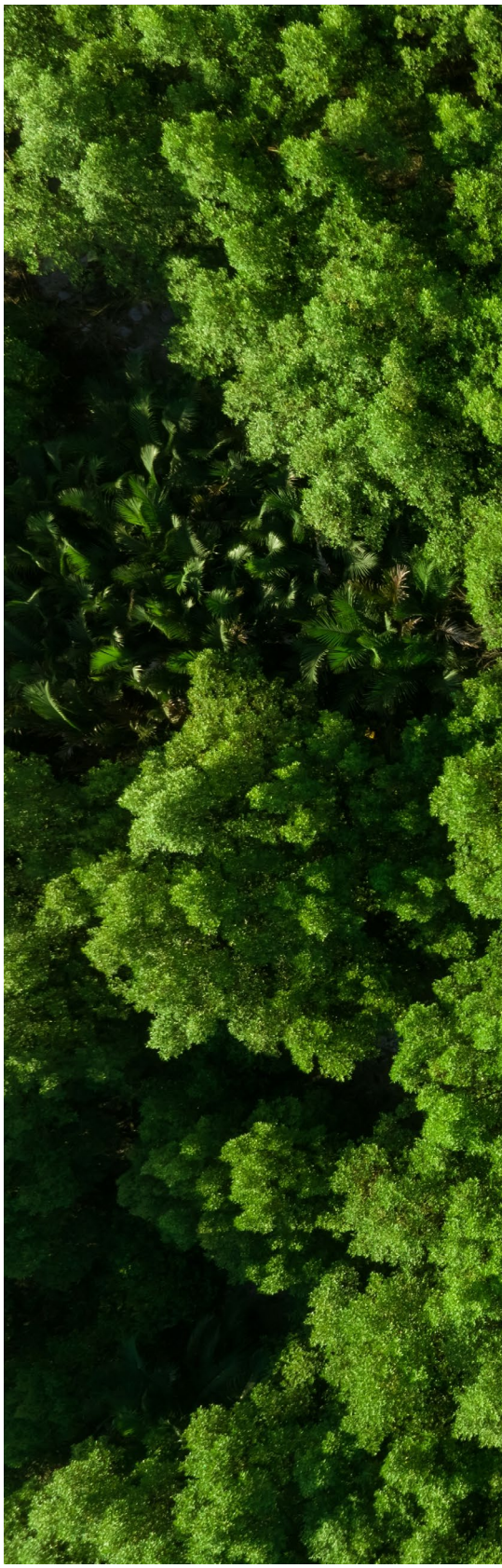
Need for a green EU industrial policy

Originally, the EU was essentially attempting to curtail Member States' use of industrial policy as it – rightly – was seen as a threat to the single market. State aid rules were drawn up with the objective of restraining Members States' use of subsidies and thereby preserving the integrity of the internal market.

At EU level, a limited industrial policy pursued two objectives: cohesion and transformation. Cohesion policy is aimed at creating equality of living conditions in the EU. It is rooted in the Single European Act of 1987 establishing a single market, and further underpinned by structural funds with substantial volume that seek to reduce economic imbalances between Member States and regions.

Transformation became an industrial policy objective primarily through the introduction of the EU Emissions Trading Scheme (EU ETS) in 2005. In line with a "carrot-and-stick approach", the EU ETS has been complemented by expenditure instruments, such as the Innovation Fund, and national measures including Important Projects of Common European Interest (IPCEIs). The Innovation Fund is a funding program for the demonstration of innovative low-carbon technologies. Part of the EU ETS legislation, it is financed by proceeds from the ETS, and has been significantly strengthened over time. Important Projects of Common European Interest (IPCEIs) are transnational innovation and infrastructure projects that make an important contribution to the growth, employment and competitiveness of European industry and the economy by means of state funding.

Along with the implementation of policies for the green transformation, the EU realized that it needed a new, more positive and coordinated approach to industrial policy. This began in the period following the eurozone crisis of 2008[8]. The European Green Deal[9] published in December 2019 emphasized the importance of mobilizing industry for a clean and circular economy, and initiating that transformation now in order for it to be completed by 2050. Among other initiatives, the Green Deal called for using the Innovation Fund for transformation projects, put forward the scheme of Important Projects of Common European Interest (IPCEIs) as a possible way to finance new value chains and announced a new EU industrial strategy to address the green and the digital transformation as well as a new circular economy action plan. Since the New Industrial Strategy of 2020[10], the new industrial policy impetus in the EU is tied to managing the twin green and digital transitions. In the update to the New Industrial Strategy in 2021, reflecting realizations after a year of global pandemic, the transition objective was complemented with a resilience objective.[11] The latter resulted from a dual realization: first, that supply chains are vulnerable. China in particular has become a dominant player in many areas of green manufacturing, including of the equipment required for the green transformation. At the same time, there have been growing concerns that China may use this dominance for strategic, political, or economic gain in the future. Second, Russia's war in Ukraine has also recently highlighted the interconnectivity of supply chain resilience and energy security. Not only has Russia used its gas exports to exert political and economic pressure on European states, but the accompanying skyrocketing energy prices have also placed a particular burden on European industry and households.



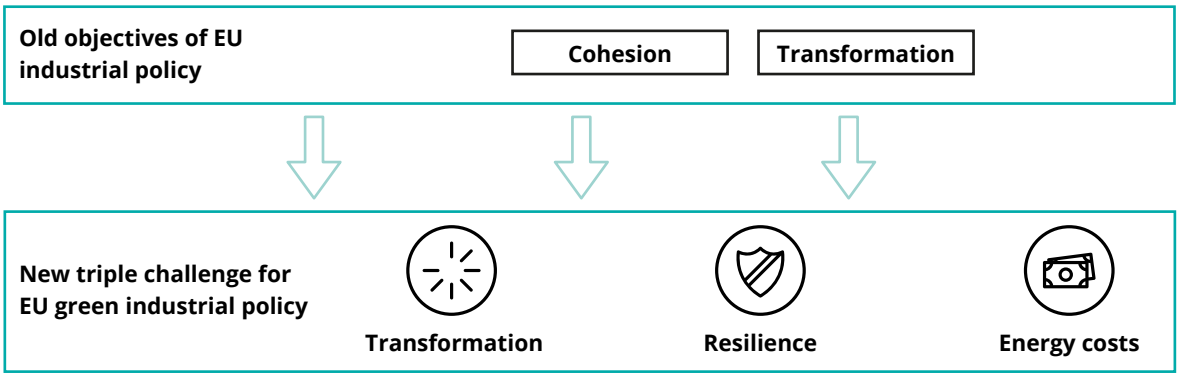
[8] Tagliapietra and Veugelers (2023),), Sparking Europe's New Industrial Revolution: A policy for net zero, growth and resilience, Bruegel Blueprint 33, Brussels
[9] European Commission (2019), Communication on The European Green Deal. COM(2019) 640 final
[10] European Commission (2020),), A New Industrial Strategy for Europe. COM(2020) 102 final
[11] European Commission (2020),), Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery. COM(2021) 350 final

However, the strategies have so far resulted in only a limited set of policies and funds at EU level. One such case is the proposed EU Carbon Border Adjustment Mechanism (CBAM), intended to prevent "carbon leakage" into the EU through imports of cheaper fossil-based products into the EU, crowding out more expensive green EU products and old fossil-based EU products subject to ETS costs.

The IRA, the USA's response to the challenge of resilience and transformation with a clear strategic, geopolitical aim of reducing economic dependencies on China, has provided additional impetus to the debate about the EU's green industrial policy. The IRA is a comprehensive, simple and highly focused policy package, and as such is highly suitable for effective communication. It offers substantial subsidies in the form of easy-to-access tax credits along important value chains of the green transformation. Overall, the IRA is a great step towards tackling climate change and puts the US economy on a path to green transition. At the same time, the IRA's emphasis on subsidies at the national level challenges the EU's transformation approach. The US approach is to make green energy cheap. In contrast, the main thrust of the EU's approach, based on the cap-and-trade EU ETS, can be characterized as making fossil fuels expensive.[12] This may put EU companies at a disadvantage on the global market. While the CBAM can counter competition from cheap fossil-based imports, it cannot protect EU companies from cheap imports of green goods or other products produced with subsidized green energy. In addition, the focus on subsidies along green value chains may attract substantial investment into the US, especially in the green manufacturing value chains with a need for a fast ramp-up this decade. As a consequence, there is a risk that the global build-up of production facilities for batteries and electrolyzers may be focused in the US, to the detriment of the EU.

[12] Since even before the Green Deal, more support schemes flanking the ETS incentives have been implemented by the EU and its member states. These also serve to make "green cheap", yet the overall thrust of the EU's approach can still be considered as making fossil expensive with the ETS.

Fig. 4 – the EU's green industrial policy challenge



Source: Deloitte

Need to respond to a triple challenge
In this changing environment, the existing framework of EU industrial policy objectives – cohesion and transformation – should be replaced by a new framework of objectives, i.e., the triple challenge for the EU's green industrial policy:

Transformation: The massive use of subsidies in other countries such as the US as a means to accelerate the green transition contrasts with the EU's focus on carbon pricing to incentivize transformation. This development thus gives rise to a more general question: Does the EU need to complement its transformation approach with additional subsidies?

Resilience: A large share of the equipment needed for the green transformation is imported into the EU. The high dependence on a small number of key suppliers, such as China, may pose a risk for the stable supply of such goods and gives rise to considerations on increasing domestic production of such equipment. In this context, the EU needs to identify ways of setting up new production in Europe to ensure the resilience of its supply chains.

Energy costs: The currently high energy costs in the EU, and especially the spike since the Russian invasion of Ukraine, affect industry more broadly, given the dependence on fossil fuel-based energy production and electricity-based manufacturing. They represent a particular challenge for the competitiveness of trade-exposed and energy-intensive industries in the EU.

Green value chains at the core of the new green industrial policy

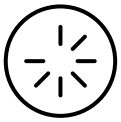
The IRA has rightly focused attention on green value chains. Green industrial policy should be developed and analyzed on a large scale with respect to the "macro" green industrial value chain put forward in Figure 4. This value chain covers the entire scope of green industrial policy in three stages: green manufacturing (i.e., the manufacturing of the equipment required for the green transformation), green energy (i.e., the generation of renewable (green) energy), and green production (i.e., the production of industrial products using renewable (green) energy).

Fig. 5 – The green industrial value chain

Green manufacturing	Green energy	Green production
Manufacturing of the equipment required for the green transformation	Supply/generation of green energy	Use of green energy in carbon-neutral production of industrial products
Examples: wind turbines, solar modules, hydrogen electrolysers, heat pumps, batteries	Examples: electricity from wind/solar power, clean hydrogen or derivatives	Examples: green steel, metals, cement, glass, chemicals production

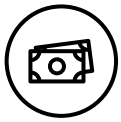
Source: Deloitte

The triple challenge and the green industrial value chain combined are the lens through which green industrial policy should be analyzed and developed. The triple challenge and the policies with which it can be addressed should be mapped onto the value chain:



Transformation of industry can be effected mainly by (1) carbon pricing that penalizes fossil fuel-based production methods in green energy and green production; (2) policy measures that support green energy supply, e.g.,., green energy feed-in tariffs or market-based production subsidies, subsidies for green H2 production or investment support for green power; and (3) policy measures to transform green production, e.g.,., by supporting the investments and higher OPEX costs with Carbon Contracts for Difference (CCfDs), or by increasing the demand for green products through green lead markets.

Resilience affects green manufacturing as it relates to risks in the supply of solar panels, electrolyzers and batteries, without which green energy or green production are not possible. It can be addressed through direct subsidies for companies in the value chains or regulatory measures including strategic standard-setting or revisions of procurement rules to encourage a domestic manufacturing base in the relevant technologies.



Energy costs are involved throughout the value chain, and related measures would have different time horizons depending on which stake of the green industrial value chain they would address. Measures in green manufacturing would be more long-term, e.g., lowering the costs of manufacturing wind turbines. In contrast, price-control measures or production subsidies aimed at lowering the costs of green energy supply would be more imminent measures. The same is true for energy cost-based subsidies, energy cost rebates or regulatory energy cost breaks with regard to green energy demand.

This highlights the fact that in addressing the triple challenge, the key decision will be which value chain stages to target with measures for the specific challenges, as the transformation and energy cost challenges in particular can be addressed with measures in the green energy or green production stages.

3. Can the IRA be a blueprint for an EU industrial policy?

The GDIP and the related documents, most notably the NZIA are the vehicle through which the EU intends to implement its new green industrial policy and react to the IRA. The still unanswered question is: Should the EU copy the IRA approach or adopt significant elements of it?

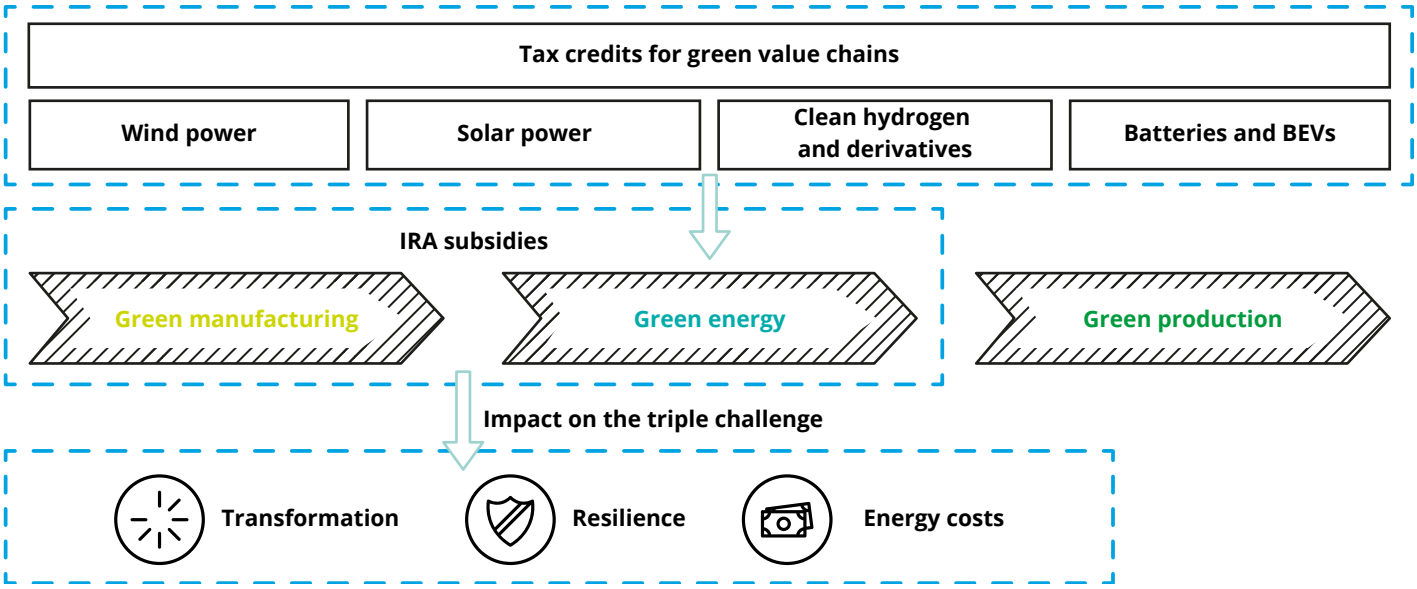
The IRA approach: Addressing the triple challenge with one simple instrument

In contrast to the EU's emphasis on carbon pricing, regulation, and innovation incentives, the IRA adopts a subsidy-oriented strategy, essentially employing "carrots" for industrial decarbonization. This approach incentivizes companies to invest in the US, particularly in the fields of green manufacturing and green energy.

Projected to reduce US emissions by 7-10% by 2030 compared to a baseline scenario, the IRA comes with estimated annual costs ranging from 0.1% to 0.3% of US GDP.[13] A defining feature of the IRA is its simplicity, revolving around tax credits that extend along the value chain for both operational expenditures (OPEX) and capital expenditures (CAPEX) of companies.

[13] Rhodium Group (2022), A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act, https://rhg.com/research/climate-clean-energy-inflation-reduction-act/

Fig. 6 – The IRA approach: one instrument for three challenges



Source: Deloitte

Figure 6 provides an overarching view of the IRA's functionality. Key to the IRA's popularity is its value chain approach; the IRA provides a series of subsidies in several sub-stages within the first two elements of the green industrial value chain, green manufacturing and green energy. In more detail, this ranges from production of energy generation equipment to the generation of clean energy, and production of clean hydrogen, derivatives and batteries. The subsidies come largely in the form of nominally fixed "production tax credits", awarded in USD per unit of output at significant magnitudes.[14] Moreover, tax credits are relatively easy to use, do not involve complex competitive applications and, perhaps most importantly, are fiscally unlimited and have no finite budget allocations that could be exhausted.

The cascade in subsequent value chain stages makes the IRA appear a very powerful instrument. Analyzing it through the lens of the "triple challenge", it actually addresses all challenges with a single instrument:

Transformation: While focusing subsidies on green manufacturing and green energy, the promotion of cheap clean fuels through a cascade of subsidies is intended to spur the transformation of industries at the "green production" end of the value chain, such as the transition towards green steel production. Although challenges to successful industrial transformation clearly exist in the USA (such as the lack of energy transport infrastructure), the IRA may render green production in the USA quite competitive on the world market through its sheer financial strength and turn the IRA into a powerful transformation policy.

Resilience: Subsidies along value chains, especially in green manufacturing, combined with support for local demand for the product through the clean energy tax credits or for purchases of battery electric vehicles (BEVs), are likely to lead to a substantial build-up of production capacity in green manufacturing in the USA, especially in "infant" value chains such as electrolyzers.[15] This will happen in the context of the USA intending to become less reliant on China in economic relations.

Energy costs: Although energy costs already are fairly low and this is not really a challenge for the USA, the subsidy cascade leading to green energy generation is likely to drive a significantly increased build-up of renewable energy in the USA and hence drive down costs for electricity through the merit order effect of RES in power markets.

[14] The IRA also contains Investment Tax Credits, directly supporting investments by effectively providing a subsidy as a high share of investment costs.
[15] Electrec, 2023, America is now the growth leader for new battery factories. https://electrek.co/2023/05/31/north-america-battery-factories/.

Overall, the IRA is clearly a smart piece of legislation with a focus on simplicity and positive incentives, which has sparked a massive media reaction.[16] This gives it immense power in political discourse, resulting in the IRA being the benchmark for other countries' and regions' green industrial policy efforts. But while the IRA's strength lies in its simplicity and focused instruments, this simplicity may also bring about restrictions that could limit its applicability in other countries. Moreover, the IRA is a "greenfield" instrument in the USA. It is the first substantial policy instrument in green industrial policy at federal level in the USA, whereas in the EU, green industrial policy needs to be developed in a "brownfield" situation with substantial existing policy instruments such as the ETS, EU effort sharing, regulatory measures for decarbonization, some of which include very strong economic incentive mechanisms (e.g., the Renewable Energy Directive II (RED II) and its implementations), and a wide and fragmented landscape of funding instruments at EU and Member State levels.

Comparing US, German and EU green industrial policy

There are two good reasons to compare existing industrial policy in the EU and the USA before coming to conclusions on how an EU green industrial policy should be designed and whether it should essentially be a copy of the IRA approach. Firstly, the comparison may reveal clear deficiencies in the industrial policy setup. Secondly, the "brownfield" situation in the EU means that new policies need to fit into the context of existing instruments, given the broad political consensus on, and significant achievements of policies such as the EU ETS.

Of course, the EU ETS is the cornerstone of EU transformation policy and is a comprehensive carbon pricing scheme for the scope of the entire green industrial value chain. In the USA, only California and the Regional Greenhouse Gas Initiative with 11 participating states on the East Coast have implemented a carbon pricing scheme. Following a strict logic, the economic efficiency of a carbon pricing approach is reduced by complementing it with target subsidies, as those may incentivize industries and actors with higher abatement costs for carbon emissions to reduce emissions. However, there are good arguments for complementing carbon prices with subsidies, particularly if those aim to reduce the costs of new, clean technologies.

Conveniently, this justification of introducing new technologies for subsidies underlies the EU's approach to structure funding in Technology Readiness Levels (TRL). Funding for research, development and innovation is classified between the low TRLs of 0-5; demonstration and upscaling is between TRL 5-8, whereas production and market entry is at TRL 9. We apply this logic to compare funding programs in the domain of green industrial policy in the USA, the EU, and Germany (as an example of an EU Member States with relatively highly developed green industrial policy instruments). Figure 7 plots programs along the dimensions of TRLs (vertical axis) and the addressed elements of the green industrial value chain (horizontal axis).

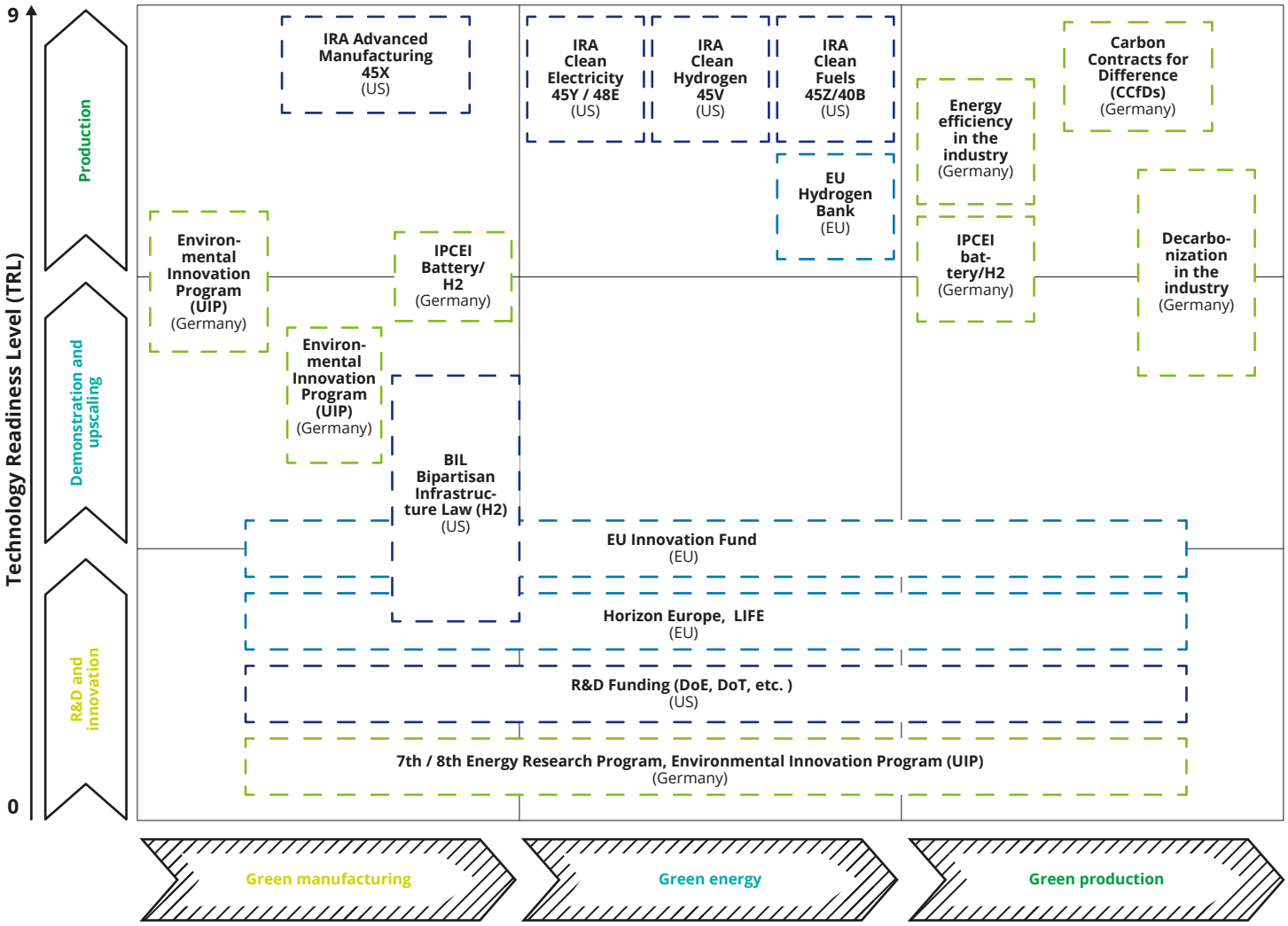
Essentially, all notable US funding programs address only the highest TRL of production and market entry. As support at this stage requires large scales in order to be impactful, these programs are substantial, taking the expected costs of IRA funding well into the three-digit billions. Moreover, as indicated before in outlining the IRA approach, they address the first two elements of the green industrial value chain only: green manufacturing and green energy.

Most EU funding programs cater to lower and medium TRLs focusing on research, innovation, development, and demonstration while not being restricted to specific sectors in the green industrial value chain. This reflects the aim of avoiding distortions of markets and competition, the risk of which is higher in higher TRLs. Research funding in Horizon 2020 and its successor Horizon Europe finance foundational scientific research (low TRLs) as well as some development and upscaling of green and sustainable technologies (medium TRLs). The EU's LIFE program specifically supports environmental, nature conservation and climate action projects throughout the EU, focusing on medium to higher TRLs. The EU Innovation Fund is one of the world's largest funding programs for the demonstration of innovative low-carbon technologies, aimed at projects with medium to higher TRLs, but still firmly excluding any level near production and market entry. The only high-level TRL program is the proposed EU Hydrogen Bank, for which EUR 800 million was allocated in the GDIP, but which is still under construction and will now also encompass the German H2Global scheme.[17]

[16] E.g. New York Times, 2022, Biden Signs Expansive Health, Climate and Tax Law, https://www.nytimes.com/2022/08/16/business/biden-climate-tax-inflation-reduction.html. The Economist, 2022:: America's climate-plus spending bill is flawed but essential, https://www.economist.com/leaders/2022/08/08/americas-climate-plus-spending-bill-is-flawed-but-essential. The Washington Post, 2022, House passes Inflation Reduction Act, sending climate and health bill to Biden, https://www.washingtonpost.com/us-policy/2022/08/12/inflation-reduction-act-house-vote/. The Guardian, 2022, Senate passes $739bn healthcare and climate bill after months of wrangling, https://www.theguardian.com/us-news/2022/aug/07/inflation-reduction-act-senate-democrats-pass. Forbes, 2023, The Inflation Reduction Act Gives Rural America Renewed Faith And Jobs https://www.forbes.com/sites/kensilverstein/2023/08/20/the-inflation-reduction-act-gives-rural-america-renewed-faith-and-jobs/?sh=3ba2872d21dd

[17] Bundesministerium für Wirtschaft und Klimaschutz, 2023, Wichtige Etappe für globalen Markthochlauf für grünen Wasserstoff: Bundesregierung und EU-Kommission machen H2Global zu europäischen Wasserstoff-Projekt. https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2023/06/20230601-bundesregierung-und-eu-kommission-machen-h2global-zum-europaeischen-wasserstoff-projekt.html

Fig. 7 – Classification of US, German and EU support programs



Source: Deloitte

National initiatives such as the German federal subsidy programs span the full range of TRLs from the lower TRL levels on funding for foundational scientific research, to subsidizing commercialization and production of green products and production technologies. Notably, projects at higher TRLs are essentially focused on the value chain stage of either green manufacturing (e.g., parts of the funding under the IPCEI umbrella and the new EU Temporary Crisis and Transition Framework (TCTF)) or green production (e.g., the Carbon Contracts for Difference scheme currently nearing the first call for applications[18]). These programs support CAPEX and, in the case of newer programs, also OPEX costs for the new technologies receiving funding.

[18] Bundesministerium für Wirtschaft und Klimaschutz, 2023, Förderprogram Klimaschutzverträge. https://www.bmwk.de/Redaktion/DE/Artikel/Klimaschutz/klimaschutzvertraege.html

The analysis in Figure 7 is highly revealing. With the IRA programs amounting to USD 200-600 billion[19] , the US has positioned itself as a pioneer in terms of broad funding of mature technologies and their market implementation, supporting the production of technologies in green manufacturing and green energy supply.

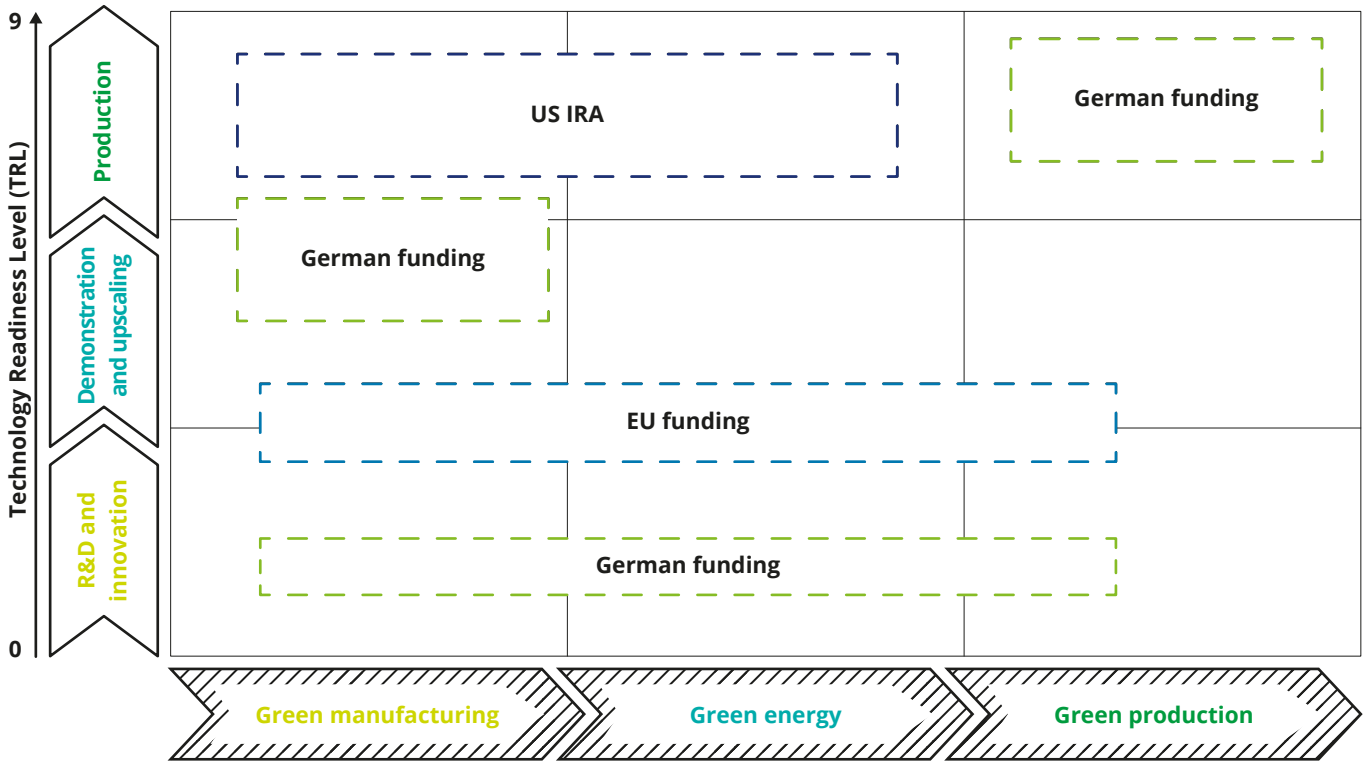
In contrast, there is a clear gap in EU funding programs for the upscaling and market introduction of green technologies, with funding instead concentrated in broad programs at lower TRL levels that are more “innocent” when seen through the old lens of thinking on industrial policy.

[19] Congressional Budget Office, 2022, Estimated budgetary effects of Public Law 117-169. Credit Suisse, 2022: US inflation reduction act – a tipping point in climate action

While the EU therefore appears decidedly timid compared to the USA, more active and large-scale funding has been introduced in the past by fiscally strong Member States as state-aid guidelines have been progressively relaxed. German funding programs include significant support at the highest TRL 9. But their profile in the green industrial value chain is very distinct from that of the USA. German funding includes large-scale production-level support for industry (green production) and smaller-scale support for green manufacturing in the green production stage, as well as support for infrastructure investments, which are not depicted in this value chain concept. However, it largely excludes the green energy stage (at least since new support under the renewable energies law has substantially diminished in scale).

While funding programs at EU level appear much less developed than in the USA since the IRA came into effect, the EU's brownfield transformation related policies also include aspects which the USA arguably does not cover at all, or only addresses to an inadequate extent. Specifically, these are significant activities and support of infrastructure for renewable energies and hydrogen, a highly developed regulatory framework around transformation-related issues, which is crucial in allowing new markets to emerge, and international activities such as energy and climate partnerships to foster mutually beneficial trade relationships especially regarding green energy generation.

Fig. 8 – US, German and EU funding: schematic



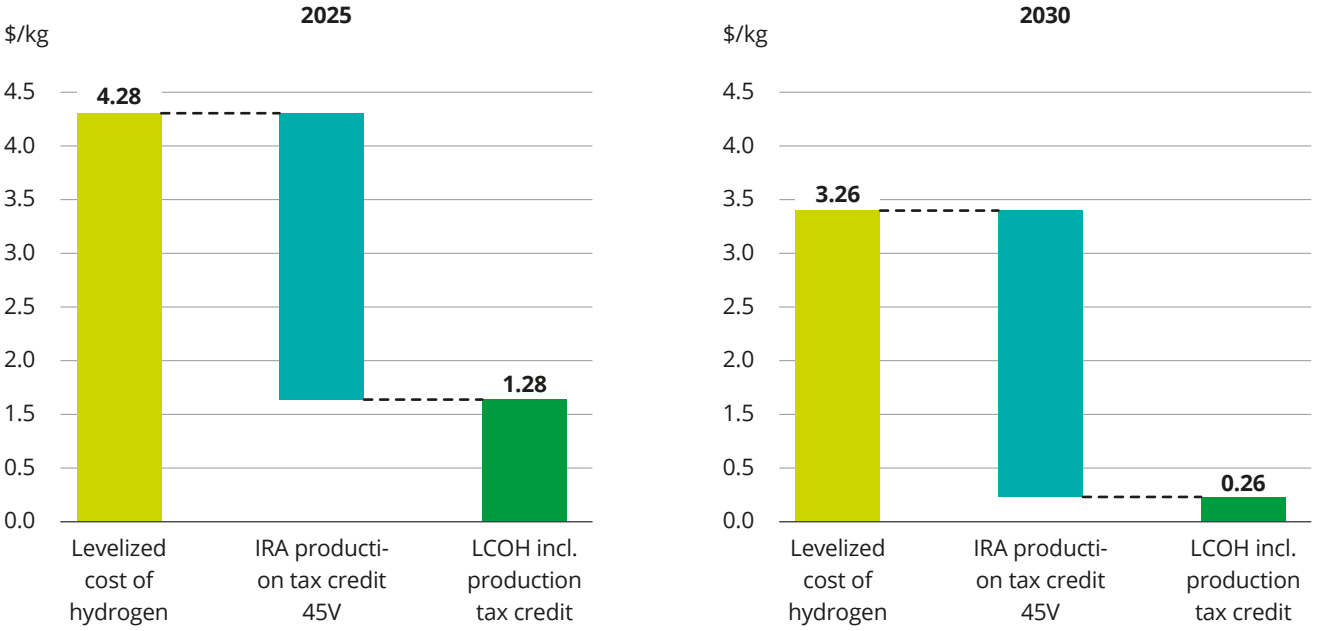
Source: Deloitte

The IRA approach is not suitable for the EU

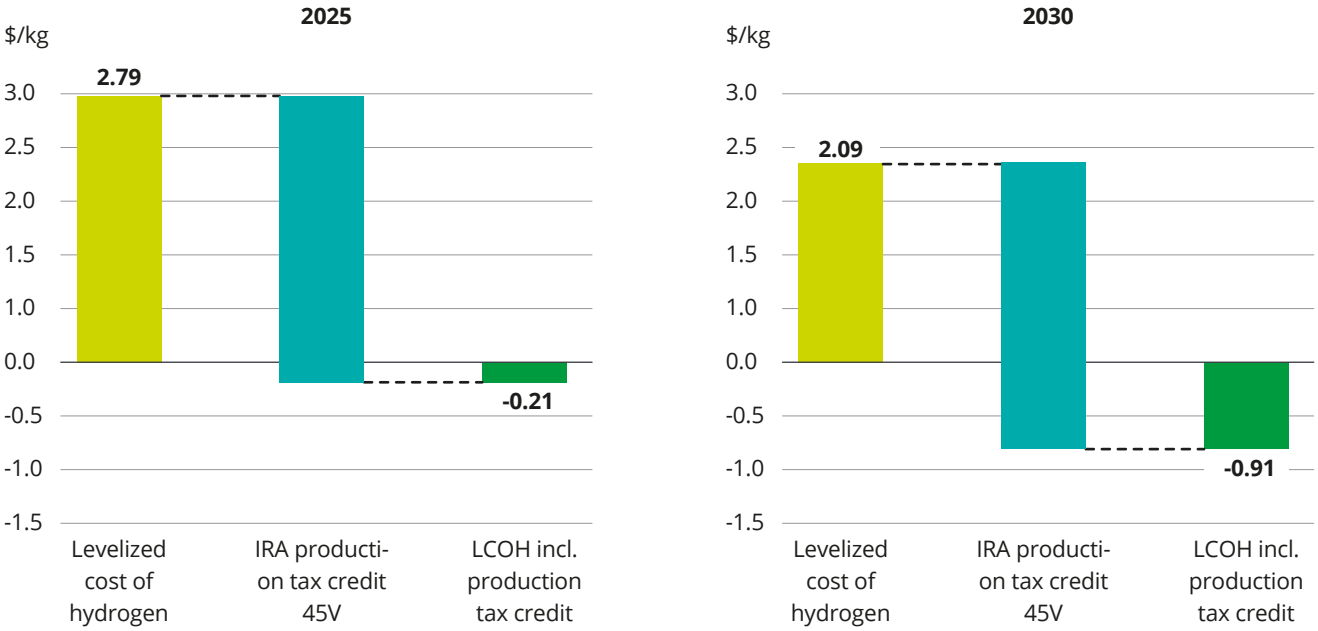
Comparison shows that current approaches in the EU and the US are structurally different in multiple aspects. Funding programs at EU level appear much less developed than in the USA. But this does not imply that the EU should take the IRA approach as a blueprint.

Fig. 9 – IRA hydrogen tax credit reduces green hydrogen costs substantially

Average levelized costs of hydrogen (LCOH) in US



Minimum levelized cost of hydrogen (LCOH) in the US



Source: Deloitte, based on Deloitte, 2023, "Green hydrogen: Energizing the path to net zero". Note: LCOHs are based on off-grid PV solar-based electrolysis, eligible for the full tax credit of $3/kg. Transport and storage costs are not considered. Minimum LCOHs are modelled for San Diego County, California.

Firstly, the **IRA approach is fiscally high risk and could be extremely costly for the EU.** Although the straightforward IRA design with easy-to-use, nominally fixed tax credits along the entire length of value chains is beautifully simple, these tax credits are by no means "smart" or market-based instruments, but risk providing excess subsidies[20], essentially windfall profits, to producers at the taxpayer's expense. This can be seen in Figure 9, showing that under some assumptions on the levelized cost of hydrogen (LCOH), the net-of-subsidies cost of producing hydrogen may turn negative with the IRA, implying a huge level of excess subsidy.

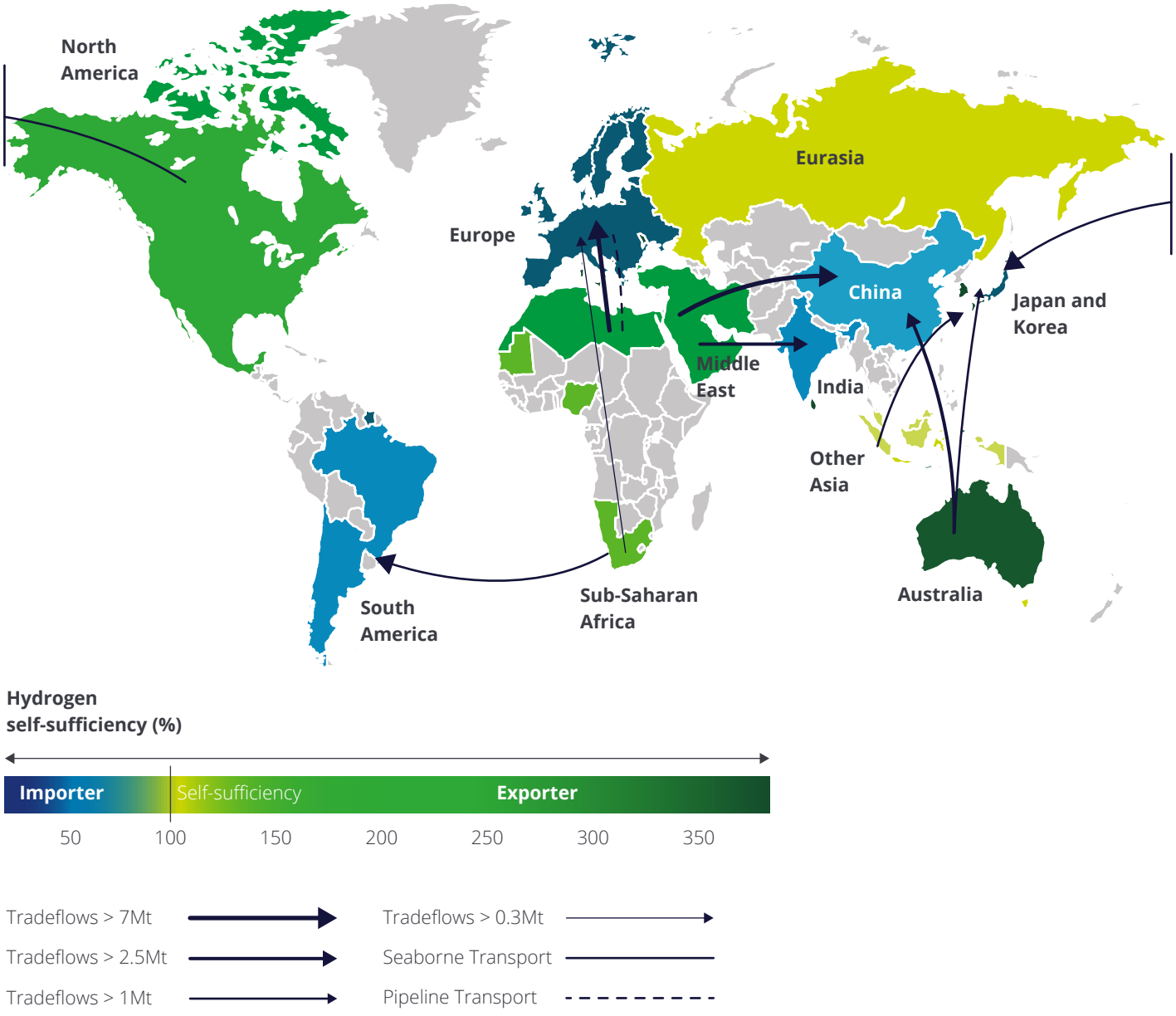
This fiscal risk is increased by the IRA's conflation of two objectives (transformation and resilience) in one instrument. While subsidizing along value chains is clearly impactful in driving transformation and resilience at the same time, it makes setting subsidy rates at the correct level to avoid excess subsidies next to impossible. A classic insight in the economic literature is that a diversified set of policy instruments may be better suited to fulfilling different objectives. The "Tinbergen rule" states that efficient policy design requires independent policy instruments for each distinct policy objective.[21] In practice this means that supply chain effects of subsidies for renewable energy generation, production of wind turbines and solar modules are likely to further drive down the LCOH for the USA, increasing the degree of excess subsidy even more. In the brownfield situation of the EU and its Member States, it would be impossible to avoid further costly interactions with existing policy instruments.

Secondly, **it is not possible for the EU to use tax credits consistently.** The EU encompasses 27 Member States, each with a different tax regime. Despite longstanding efforts, the EU has not managed to establish a common corporate tax base, and effective corporate tax rates differ wildly across Member States[22]. This makes a consistent application of tax credits impossible in the EU. Furthermore, although the European Commission encouraged Member States to use tax credits for net-zero technologies in the GDIP, it is highly questionable whether tax credits can be implemented in the different EU Member States similarly to the USA as genuine production subsidies through the tax system.

Thirdly, **the IRA's value chain approach is unsuitable for the EU.** The USA is targeting two sequential elements of the green industrial value chain with its cascade of subsidies: green manufacturing and green energy. The transformation logic is to make green energy so cheap and attractive in the USA that industrial decarbonization will become profitable. However, this approach is suitable for the USA because it is fortunate to have ample potential for cost-effective renewable energy generation. In the EU, locations ensuring a large share of full-load hours for renewable power generation are much scarcer[23]. The EU will remain a net importer of green energy (mainly in the form of hydrogen and its derivatives) in the net-zero age while the USA will be above self-sufficient. As Figure 10 shows (see following page), Europe will be one of the world's biggest importers of hydrogen in 2030 while North America will be a small net exporter of hydrogen.[24]

[20] German council of Economic Experts, 2023, The inflation Reduction Act: Is the new U.S. industrial policy a threat to Europe. https://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/PolicyBrief/Policy_Brief_2023_01_ENG.pdf
[21] Tinbergen, 1952, On the Theory of Economic Policy, North-Holland, Amsterdam.
[22] The economist intelligence, 2021, Tax harmonization is a tricky sell in Europe. https://www.eiu.com/n/tax-harmonisation-is-a-tricky-sell-in-europe/
[23] Dezernat Zukunft, 2023, Zwischenbericht: Die Zukunft der energieintensiven Industrien in Deutschland. https://www.dezernatzukunft.org/wp-content/uploads/2023/03/Zukunft-der-energieintensiven-Industrien-Zwischenbericht-Maerz-2023-Frontier_IW_DZ.pdf
[24] Deloitte, 2023, Green hydrogen: Energizing the path to net zero.

Fig. 10 – Global hydrogen trade between key regions, 2030



Source: Deloitte, 2023, "Green hydrogen: Energizing the path to net zero".

This implies that targeting green energy with industrial policy is difficult for the EU as this would generally favor expensive EU production over more efficient imports. Rather than subsidizing domestic green energy against existing comparable disadvantages, a strategy that subsidizes the demand for green energy promises greater flexibility and efficiency. Industries undergoing transformation can make use of the most cost-effective energy supply options, which might include both domestic and imported sources.

Accordingly, the current approach in the EU and its Member States that was analyzed in the preceding section reflects this by focusing funding on green production, creating demand for green energy without favoring domestic production over imports. For example, the German Carbon Contract for Difference (CCfD) scheme follows precisely that strategy. Hence, adding a large-scale IRA-inspired instrument into the brownfield industrial policy in the EU would also lead to further problematic interactions between instruments.

4. A differentiated EU green industrial policy approach

The EU needs to react to the IRA with new transition and resilience policies
While the EU should not take the IRA approach as a blueprint, it still urgently needs to find a way forward to design its own industrial policy. The IRA substantially ups the need for EU-level action on two aspects of the triple challenge of green industrial policy.

1. The EU needs to regain the initiative on transformation policy.
The EU's carbon pricing and regulation-based approach to incentivizing transformation, complemented by funding for lower TRLs was the "only game in town" for a long time. It is now challenged by large-scale subsidy-based approaches, not only by its rivals (China), but also by its closest ally and economic counterpart (the USA) as well as other large economies (such as India).

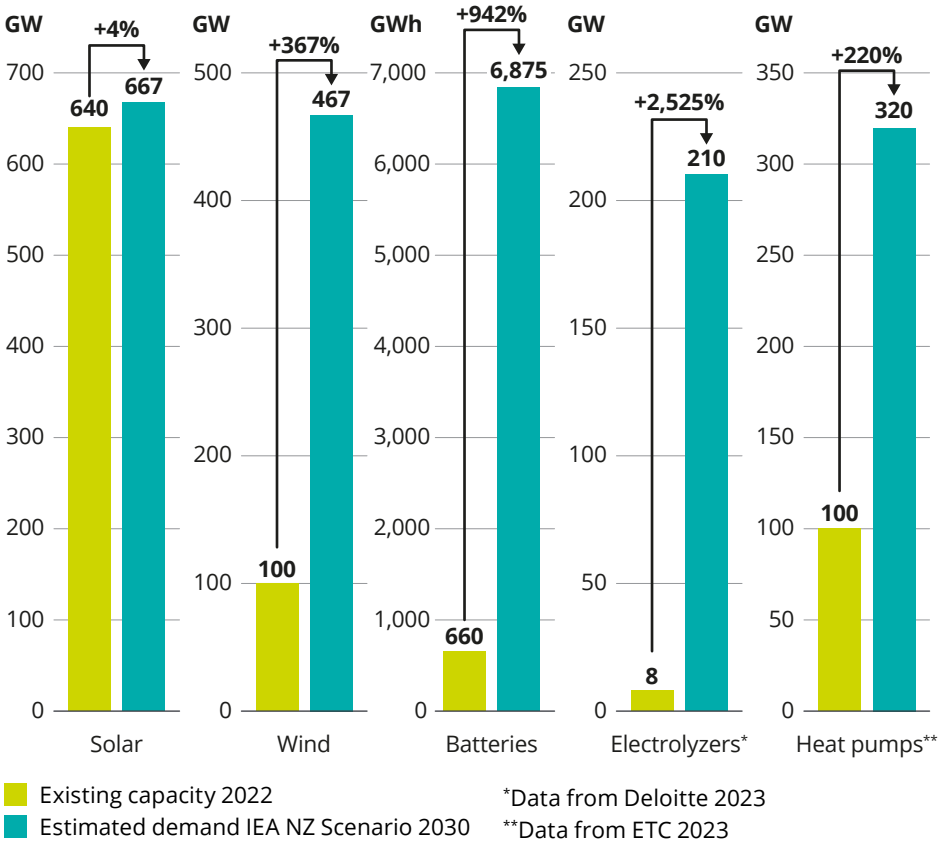
With the magnitude of IRA support, there is a real risk that transformation of industry towards green production will happen in the USA with its cheap green energy rather than in the EU with expensive fossil energy. The coming EU-CBAM is not an effective counter to this challenge. After losing out to the USA in the digital transformation, the EU should be careful not to lose out on value-added intensive parts of new industrial value chains.

2. The IRA exposed the EU's lack of a resilience policy.

While discussions about strategic rivalry with China and the need for resilient supply chains have been going on for a while in the EU, a substantial policy has yet to be drawn up. Quite the contrary in the USA: The value-chain cascade approach in green manufacturing and green energy is setting strong incentives for producers in key green manufacturing value chains (solar, wind, batteries, electrolyzers) to locate new capacity in the USA.

While the policy is arguably aimed at reducing US dependency on China, it increases the problem for the EU, which is facing the same challenge. Limited attention and execution capacity of investor companies is drawn to the USA in the crucial period until 2030. During that period, resilience risks will peak as green manufacturing products will be essential for decarbonizing subsequent stages of the green industrial value chain in the context of a need for a huge further ramp-up of global production capacities and massive domination by China in many such markets.

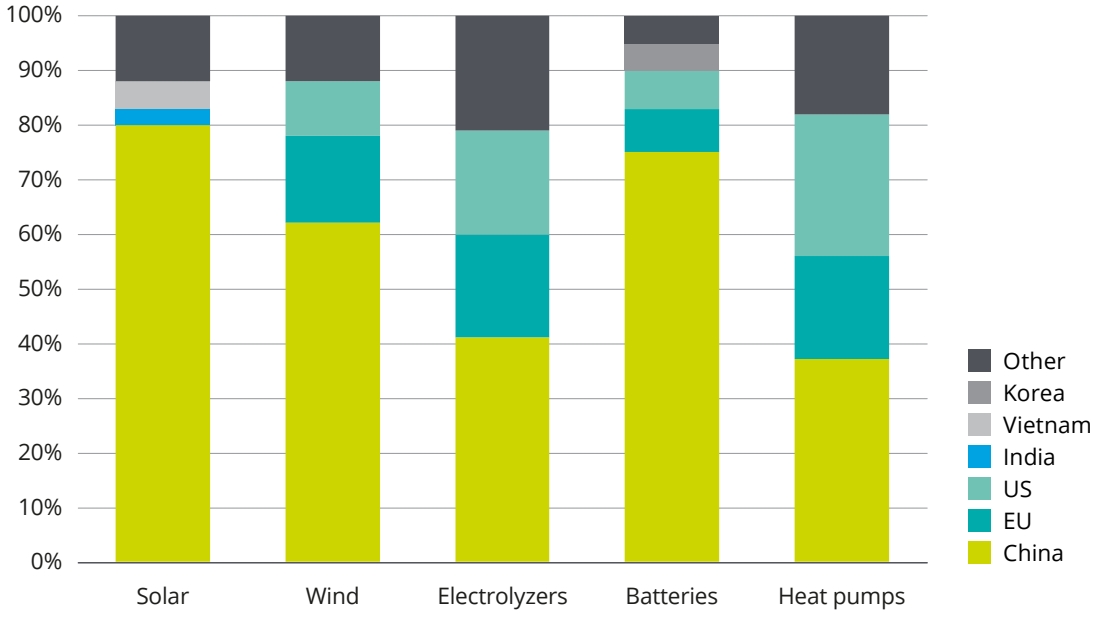
Fig. 11 – Global ramp-up requirements for green manufacturing value chains



Source: IEA, 2023, The state of clean technology manufacturing; ETC, 2023: Better, Faster, Cleaner: Securing clean energy technology supply chains. Deloitte, 2023, Green hydrogen: Energizing the path to net zero. Own representation.

Fig. 12 – World market shares of major exporters in green manufacturing products, 2022

Share of global supply



Source: IEA, 2023, The state of clean technology manufacturing. Own representation.

An appropriate strategy and policy response to the IRA is therefore required by the EU regarding the transformation and resilience challenges. The energy cost challenge is equally important[25] and needs to be appropriately addressed by EU green industrial policy, but is not part of the EU's reaction to the IRA.

The response needs to be bold and strategically consistent

The EU has understood the challenge that the IRA constitutes and developed a policy process relating to the GDIP. But the policies proposed and adopted so far under the GDIP, NZIA, CRMA, TCTF etc. require further improvement. Although they include all the keywords of the debate, they would benefit from more direction and strategic thrust. In a previous study[26], we showed that the plans and policies are too complex and fragmented. Many others have come to similar conclusions.[27]

Achieving a bold response requires a degree of simplicity. Achieving this at a strategic level must imply more action at EU level – which, if done right, would be welcomed by industry actors and would also protect the integrity of the EU's internal market compared to decentralized action predominantly by fiscally potent Member States. In terms of implementation, simplicity of industrial policy usually involves a trade-off between impact and the risk of economic distortions and fiscal costs. A better balance should and can be achieved than in the past, when the EU and Member States were often criticized for excessive bureaucratic complexity. Smart market instruments should be used rather than nominal subsidies, and these market instruments should be designed pragmatically, with more emphasis on simplicity. Efforts towards speeding up implementation processes, especially relating to faster permitting or licensing, need to be redoubled across the Union.

The EU's response also needs to be strategically consistent. It must reflect the structural needs of and conditions for industrial policy in the EU as well as fitting into the brownfield of existing policy instruments. A single-instrument approach across sequential elements of the green industrial value chain, such as the IRA, is not appropriate for the EU. Instead, the policy response should consist of two policies, one for each challenge to be addressed (transformation and resilience).

Finally, the response should also eschew protectionist reflexes. Protectionism is not a game in which one only loses in the long run. One can also lose in the short run, because goods produced domestically only because of protectionist policies are more expensive than imports.

Main arms of the EU's green industrial policy

A new EU green industrial policy should be implemented through a revision of the GDIP and its ancillary documents. It should consist of three main arms, the first two of which constitute the EU answer to the IRA:

1. A **broad transformation policy** setting incentives for a large-scale decarbonization of emissions-intensive industries in green production. This policy should counter the challenge posed by the IRA and other countries' subsidy programs to the successful decarbonization of crucial industries in the EU. This policy will be addressed in detail in section 5.

2. A **targeted resilience policy,** working much more surgically than IRA subsidies by identifying individual at-risk "weakest links" in green manufacturing value chains and addressing them through tailored policy responses without resorting to indiscriminate protectionism as the current NZIA does. This policy will be addressed in detail in section 6.

3. **Bridging support for energy prices:** Energy prices in the EU currently pose a structural challenge for energy-intensive industries as subsidies in the US and China further broaden the gap. Scaling up renewable energy deployment across the EU is a prerequisite for industrial competitiveness as it will contribute to reducing energy prices in the EU. In the period before increased renewable deployment reduced energy prices, proposals to introduce temporary support measures for energy-intensive production deserve serious and thorough consideration. Not addressing this issue could endanger important ongoing transformation (e.g. electrification) processes in industry, could lead to serious repercussions throughout further value chains and substantial losses of EU output.[28] To limit the fiscal implications and the distortion of energy markets, any such support would need to be very carefully targeted to energy-intensive production with large downstream significance in trade-exposed value chains. Also, negative impacts on the internal market of the EU due to uncoordinated and uneven national measures should be seriously taken into account. However, a deeper discussion of this important policy area is outside of the scope of this paper.

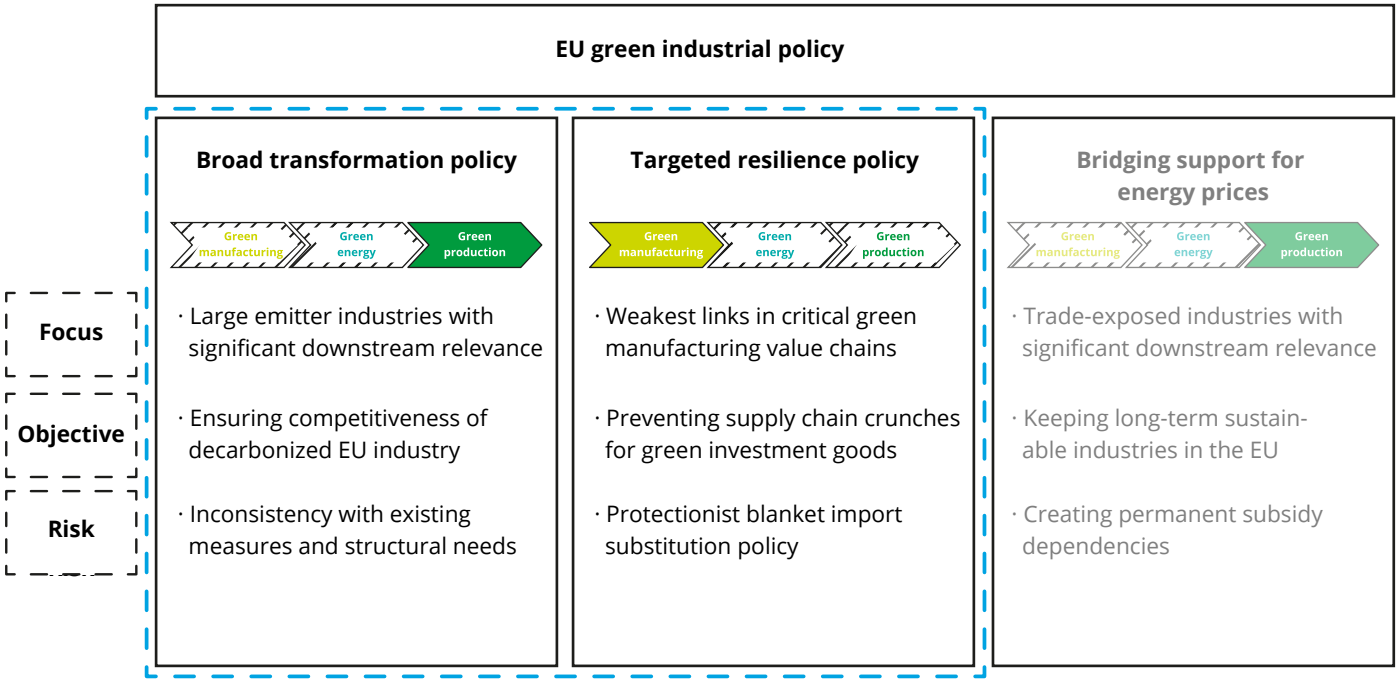
[25] German council of economic experts, 2023 How should Europe respond to the inflation reduction act? https://www.sachverstaendigenrat-wirtschaft.de/en/media/details/policy-brief-inflation-reduction-act-pressrelease.html

[26] Deloitte (2023),), "IRA and the net-zero race – How EU industrial policy should respond", https://www2.deloitte.com/content/dam/Deloitte/de/Documents/about-deloitte/Deloitte-EU-Green-Industrial-Policy-Study.pdf

[27] Example: Heinrich Böll Stiftung, 2023, Why the European response to the IRA must be more Europe. https://eu.boell.org/en/2023/03/24/why-european-response-ira-must-be-more-europe; Tagliapietra, Veugelers, Zettelmeyer (2023),), "Rebooting the European Union's Net Zero Industry Act". https://www.bruegel.org/sites/default/files/2023-06/rebooting-the-european-union%E2%80%99s-net-zero-industry-act-%289177%29_2.pdf German council of economic experts, 2023 How should Europe respond to the inflation reduction act? https://www.sachverstaendigenrat-wirtschaft.de/en/media/details/policy-brief-inflation-reduction-act-pressrelease.html

[28] E.g. J. Steitz and A. Kölschbach Ortego, 2023, Implikationen langfristiger Energiekostenunterschiede für energieintensive Industrien und den Wirtschaftsstandort Deutschland,,Dezernat Zukunft Policy Brief https://www.dezernatzukunft.org/wp-content/uploads/2023/08/Steitz-J.-Koelschbach-A.-2023-Policy-Brief-Industriepolitik-2.pdf

Fig. 13 – Arms of a differentiated eu green industrial policy



Source: Deloitte

Actionable insights

The policy response to the IRA should consist of two main arms and should be implemented through a revision of the GDIP and its ancillary documents: First, a broad transformation policy addressing the decarbonization of industry by focusing on green production and second, a targeted resilience policy addressing the weakest links within green manufacturing supply chains.

Bridging support for energy prices is not analyzed in detail but should be given serious consideration. Not addressing this issue could endanger ongoing transformation in industry and lead to serious repercussions throughout further value chains with substantial losses of EU output. To limit the fiscal implications and the distortion of energy markets, any such support would need to be very carefully targeted to energy-intensive production with large downstream significance in trade-exposed value chains.

More EU level measures required. A focus on few bold measures at EU level is required to reduce the excessive complexity of the EU's current approach. Facilitating actions by member states by relaxing state-aid rules may be politically easier but leads to more fragmentation of the policy landscape and poses dangers for the EU's internal market.

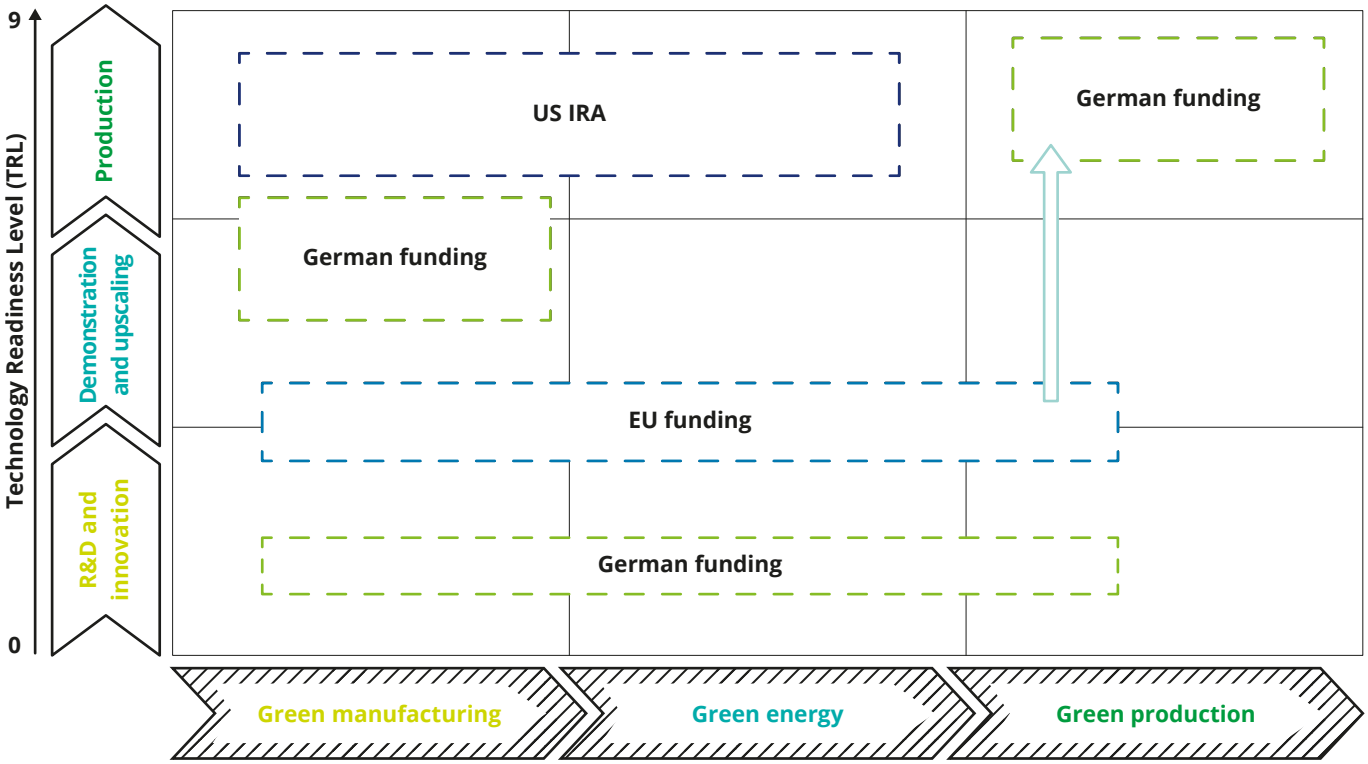
Simplicity as key design criterion. Smart instruments should be used by the EU to provide more fiscal efficiency than the nominal subsidies of the IRA, but the design of such market instruments needs to emphasize simplicity of use and not fall into the trap of excessive bureaucratic procedures.

5. A broad EU transformation policy

Need for a broad funding instrument for green production at EU level
The EU's present approach to transformation, relying mainly on the ETS, regulation and a complex and fragmented landscape of funding at Member State level, needs to be complemented. This complement should clearly be a funding instrument at EU level addressing the obvious gap in EU funding at the highest Technology Readiness Level of production and market entry, where the US IRA programs are focused and expected to create strong and impactful incentives.

To avoid problematic interactions with existing instruments at EU and Member State level, this instrument should address the green production stage of the green industrial value chain. This will ensure that in consistency with existing instruments and the EU's situation as a net importer of energy and especially hydrogen, decarbonization of industrial production is incentivized by supporting the demand for, rather than the supply of, green energy.

Fig. 14 – Need for development of eu transformation funding



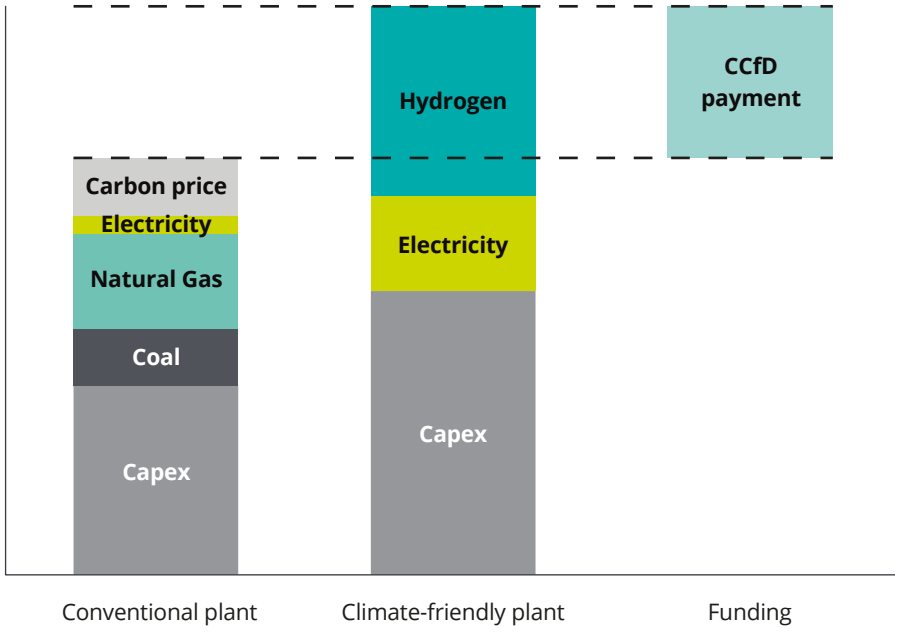
Source: Deloitte

Carbon Contracts for Difference (CCfDs) could be the main transformation instrument

A CCfD scheme like the instrument presently under development in Germany[29] should be considered as the instrument of choice. CCfDs exhibit all the desirable characteristics for the central instrument of the broad decarbonization policy. They are smart, market-based instruments funding only the differential costs between fossil-based and green production methods that remain after accounting for the carbon price penalizing fossil production methods. They are hence consistent with the EU's central instrument, the ETS, while also complementing it with a funding instrument. With funding volumes dependent on the difference between differential costs and the carbon price in the ETS, funding is set to decrease over time as the carbon price rises on the way to net zero. As funding is awarded in a competitive auction setting, bidders have an incentive to bid the lowest possible differential costs, thereby reducing the risk of excess subsidization.

Fig. 15 – Stylized illustration of CCfD support

Cost components of companies



Source: Deloitte, based on BMWK (2023).

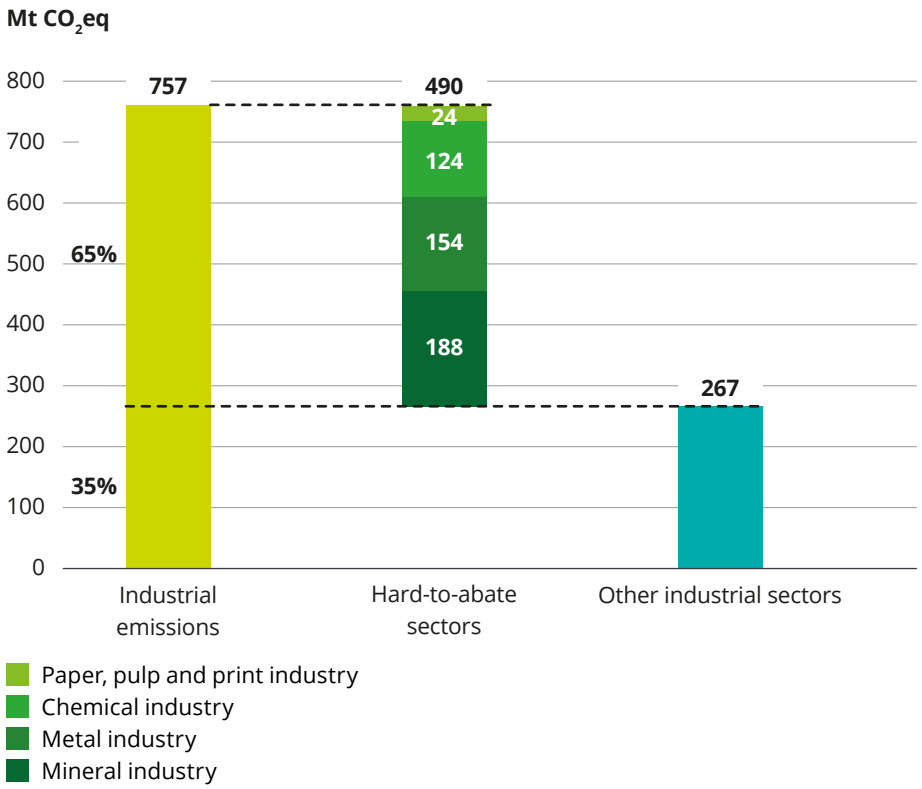
[29] Bundesministerium für Wirtschaft und Klimaschutz, 2023, Förderprogram Klimaschutzverträge. https://www.bmwk.de/Redaktion/DE/Artikel/Klimaschutz/klimaschutzvertraege.html

A focus on supporting green production can be easily achieved with CCfDs and is indeed enshrined in the German implementation of the concept although CCfDs or CfDs (Contracts for Difference not referenced to the carbon price) can theoretically also be implemented with ease in other sectors such as green energy.

The ability to support both CAPEX and OPEX is another important characteristic of CCfDs. As many technologies in green production are very OPEX-heavy (due to substantial need for expensive hydrogen as a fuel or for material use), the pure CAPEX focus of earlier cost-based funding instruments (funding a demonstrated additional cost for a green vs. a conventional plant) would be insufficient to incentivize transformation.

Finally, a CCfD scheme at EU level would also contribute to reducing the substantial fragmentation of policy instruments through its sheer size. This would help to raise the profile of the EU's policy response, while also protecting the integrity of the EU's internal market.

Fig. 16 – 2021 emissions share of eu hard-to-abate sectors



Source: Deloitte, based on EEA.

Focus on emissions-intensive base materials sectors with significant downstream relevance

Within the "green production" value chain stage, the focus of the instrument should be more finely tuned to emissions-intensive production of base materials, the hard-to-abate sectors (due to mostly requiring completely new production methods using electricity or hydrogen, the latter often for its material properties rather than just as an energy carrier) encompassing the production of steel, other metals, cement, paper or chemicals. There are two reasons for this: firstly, excess subsidies become a risk even for market instruments in a cascade of subsidies, which therefore should be avoided if possible. And secondly, these sectors are the most relevant ones in terms of avoiding industrial carbon emissions.

While the impact on reducing carbon emissions of EU industry is important, it does not yet fully justify focusing CCfDs on the hard-to-abate sectors. Indeed, an additional restriction should be included: The instrument should only support sectors connected to highly productive, value-added-intensive downstream sectors. It is often argued that supporting the green transformation of base material production in the EU is unwise as the sectors exhibit rather low productivity, making them an expensive target for little social gain.[30]

However, downstream linkage of the sectors may be crucial. Often, industrial users downstream from base materials production are very productive and value-added-intensive. But the question as to whether the upstream base materials production could simply be substituted with imports is not trivial in practice. Although imports, such as of steel, may appear an attractive option when browsing trade data, in practice even base materials often turn out not to be homogenous global commodities for which one unit of domestic production can easily be substituted with an indistinguishable imported unit.

Industries such as steelmaking produce many different qualities and types of products which, especially for high value-added use, are often not easily substitutable with imports as they require exact specifications. For some downstream uses, "hot-link" integrated processes with base material production are necessary or more efficient, making substitution with imported intermediate products much more costly due to substantially reduced energy-efficiency. In conclusion, facilitating the transformation of base material production with a CCfD scheme would contribute to both the environmental and the economic components of the transformation objective. Protecting high value added in downstream industries (or allowing new such uses to cluster around base material production) would be achieved through this instrument.

[30] Sgaravatti, Tagliapietra and Zachmann, 2023, Adjusting to the energy shock: the right policies for European industry. Bruegel Policy Brief. https://www.bruegel.org/sites/default/files/2023-05/PB%2011%202023_0.pdf

Preventing long-term subsidy dependency and generating positive externalities

The risk of subsidies creating a long-term subsidy addiction in supported industries can be countered effectively through the design of CCfDs. This can be achieved by setting maximum bid prices (a standard feature of every auction instrument) sufficiently low. As the carbon price increases during the contracting period, the payout from the CCfD contract will reduce and eventually become zero or negative. Indeed, CCfDs should be designed in this way as it ensures that funded projects are economically sustainable without support at the end of the funding period.

There are two further potential benefits through positive externalities of such an EU CCfD-scheme for transforming base material production. Firstly, as the scheme would support the market introduction of new technologies required for the green transformation of industry at substantial scale, it would contribute to deployment-related learning and hence a reduction of technological costs in future. This could also allow economically weaker regions of the world to eventually decarbonize their base material production.

Secondly, in the EU, the availability of green steel, cement etc. at scale could give a substantial push for the development of specific markets for green products. Although the green products are expected to have the same material properties as products of fossil-based production methods, some customers will be willing to pay more for green products, e.g., in order to decrease the "scope 3" total carbon footprint of their production. Such a willingness to pay "green premia" can further facilitate market investments in green production with less or no financial support. But for this to occur, it is important that markets are brought into existence for such products along with their prices, which this scheme would help to bring about.

Implementation issues

The scheme should be set up as a new EU program. The crucial difficulty would probably be political, i.e., acquiring the necessary funds for such a vast program at EU level. Member States tend to be unwilling to commit large amounts of funds to EU level, and existing funding sources, even the EU Innovation Fund, fed by proceeds from ETS auctioning that may be set to increase, would not possess sufficient financial capacity without substantial modification or enhancement of its revenue sources. Also, in line with the simplicity requirement, it is imperative that the scheme be designed with simplicity and ease-of-use being a core consideration, ideally achieving a much less bureaucratically cumbersome process than e.g. the applications for IPCEI have proven to be.

Indeed, a new political consensus should be sought an fought for to allow EU-level implementation – be it through an increased EU budget, financed by the member states or EU debt, or through increased allocation of ETS revenues to the EU budget rather than that of member states. An EU response to the IRA challenge cannot be successful without providing for much more and faster financial capability at EU level.

Very much a second-best compromise would come in the form of a consistent, EU-harmonized approach, funded at Member State level with a sufficient form of support to fiscally weaker Member States to ensure consistency of the program and reduce damage to the EU's internal market.

Complementary and conflicting other instruments

Although the CCfD scheme should be the core instrument of the EU's new broad transformation policy, it should be accompanied by further instruments and policies. Two areas stand out:

First, the transition of industries can only be successful if required infrastructures are in place. These include particularly infrastructure and grids related to electricity and hydrogen, which are imminently required for the green transition, and rail and digital infrastructures, which play an extremely important supporting role. While the state of infrastructure, the so-called mid-stream, is generally evaluated by experts to be better in the EU than e.g. in the USA, massive increases of infrastructure investment will be required[31]. The EU and its member states are responsible to ensure that this necessary condition of the green transformation is satisfied: With clear and consistent strategies, a regulatory framework at EU level and with public investment and support programs for private infrastructure investment.

Second, efforts towards establishing "green lead markets" for products incorporating base materials from green production would be helpful as they will reduce the financial support requirements for subsequent investments in green production. Such efforts may encompass a range of political measures, ranging from integrated embedded carbon limits for final products, through green criteria in public procurement or requirements to improve data collection and quality, to measures supporting "early investment in strategic, circular and innovative solutions".[32]

[31] For example an annual investment need in the EU of EUR 302 bn, requiring an increase by EUR 87 bn per year is found in Klaaßen L, Steffen B: Meta-analysis on necessary investment shifts to reach net zero pathways in Europe, Nature Climate Change, 5 January 2023

[32] Agora Energy Transition, 2021, Lead markets for climate neutral basic materials and products. https://static.agora-energiewende.de/fileadmin/Success_Stories/PW/PW_EU_Lead-markets/A-E_243_Succ_Stor_Pathways_IND_EU_Lead-Mks_WEB.pdf

As green lead markets are also an instrument that works towards green transformation from the demand side rather than the green energy supply side, they are relatively easily compatible with CCfDs and the ETS.

On the other hand, the EU is currently developing one instrument that does not fit into the normal bracket of high TRL support only for green manufacturing or green production. The intended EU Hydrogen Bank, now set to encompass the existing German H2Global two-sided auction scheme for hydrogen derivatives, would essentially work at the green industrial value chain stage of green energy by buying green hydrogen from its producers. This introduction of a green energy instrument in the context of a brownfield landscape of existing instruments at the green production stage is likely to create undesirable incentive interaction effects (especially relating to fiscal wastage due to excess subsidies becoming available to some market participants) regardless of the existence of an EU CCfD scheme.

However, such an instrument could at least further support the emergence of the as yet unestablished green hydrogen market in the EU. However, to this end, the design of the instrument should be adjusted to generate and communicate to the market the producer costs and thus market price requirements for green hydrogen, which the present proposal would not achieve, according to experts.

Summary: A bold response to the IRA requires political courage
By putting an EU-level or EU-harmonized Carbon Contracts for Difference (CCfD) scheme for base material production with significant downstream relevance at the heart of an entirely new EU transformation policy, the EU could indeed provide a convincing response to the transformation challenge posed by the IRA.

Actionable insights

A CCfD scheme at EU level, supporting industrial decarbonization in the green production stage, should be considered as the centerpiece of the broad transformation policy. This scheme should be modelled along the lines of the scheme currently under develop-ment in Germany and address hard-to-abate sectors with significant downstream relevance.

The scheme should be considered as set up as an EU program. Despite political obstacles, an EU program designed with simplicity should be set up. Funding could be provided by increased EU budget contributions of Member States, issuance of EU debt or increased allocation of ETS revenues to the EU budget. An EU-harmonized approach funded by Member States would be a much less desirable second-best choice.

The CCfD scheme should be accompanied by further instruments. First, an ongoing push to develop critical infrastructures including electricity, hydrogen and rail grids as well as digital infrastructures as the green transformation requires massive increases in infrastructure investment. Second, efforts towards establishing “green lead markets” for products in-corporating base materials from green production would be helpful as they will reduce the financial support requirements for subsequent investments in green production.

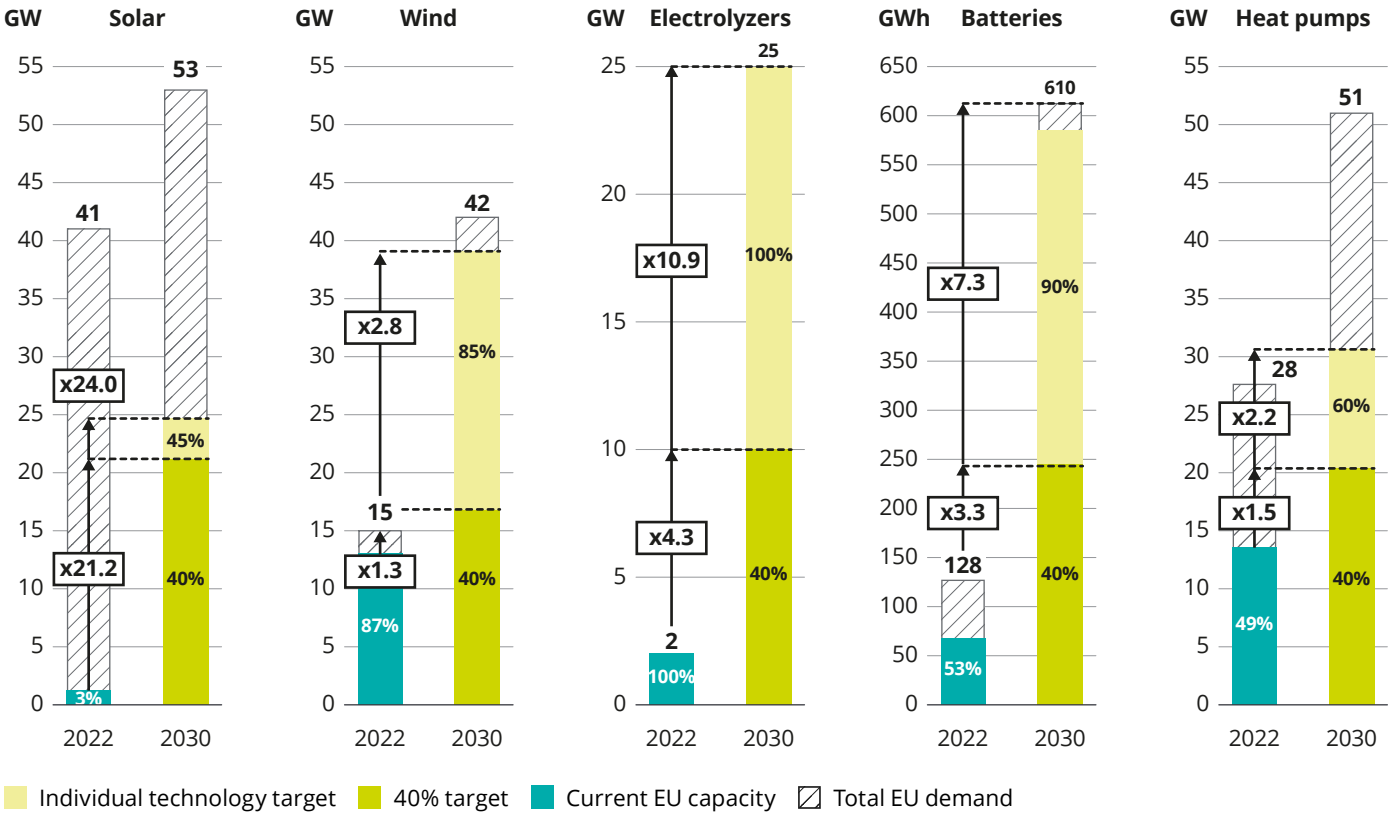
6. A targeted EU resilience policy

Resilience risks can turn into political and economic vulnerabilities

As developed in the preceding analysis, the EU needs to adopt a targeted resilience policy. Resilience risks in the domain of the green transformation mainly exist in the realm of the "green manufacturing" sector. Global demand for many of the crucial investment goods underpinning the green transformation is set to rise drastically this decade. There is often high global concentration of production, especially in China.

And the USA is likely to attract substantial investment volume in the green manufacturing sectors covered by the IRA. For the EU, this creates the risk of scarcity of these investment goods at critical moments of the transformation, particularly in the case of a mismatch between global supply and demand, or of political vulnerability, as dominant supplier positions on the world market could be abused for political purposes.

Fig. 17 – NZIA targets and ramp-up requirements as share of deployment



Source: EU Commission, 2030, Investment needs assessment and funding availabilities to strengthen EU's Net-Zero technology manufacturing capacity, COM(2023) 68 final. Solar Power, 2023, EU market outlook for solar power 2022-2026. IEA, 2022: https://www.iea.org/data-and-statistics/charts/battery-demand-by-region-2016-2022. Epha, 2023, European heat pump market and statistics report 2023. Bundesverband Windenergie, 2023, https://www.wind-energie.de/themen/zahlen-und-fakten/europa. Own representation.

Current EU approach is needs further improvement

The instrument of choice for the EU to work towards the resilience objective in green manufacturing is the Net-Zero Industry Act (NZIA). This act was proposed in March 2023 and is to be updated in the early autumn of 2023. The NZIA in its present guise has come under considerable criticism.[33] The two key weaknesses are:

- An indiscriminate goal that "the manufacturing capacity in the Union of the strategic net-zero technologies listed in the Annex[34] approaches or reaches at least 40% of the Union's annual deployment needs".[35]
- No appropriate instruments to reach the goals. The main instrument discussed in the NZIA is regulatory facilitation, which is perceived by neither industry stakeholders nor experts to be the key obstacle to investment and economic activity in the technologies.

The blanket goal of 40% is not further substantiated in the NZIA and conflates two different objectives. The NZIA refers both to the objective of resilience and to "enhancing the competitiveness of Europe's net-zero industry"[36]. While the goal of EU competitiveness is not wrong, its implementation with blanket EU production targets would require elements of a protectionist import substitution policy, although no actual policy measures are formulated in the act. However, ongoing discussions about using procurement rules "strategically", i.e., to favor EU producers via criteria only they can fulfil, are indications of potential protectionist consequences. Closing the policy gap in the NZIA under its present approach would contain the risk of an unnecessarily expensive and thus slow green transformation.

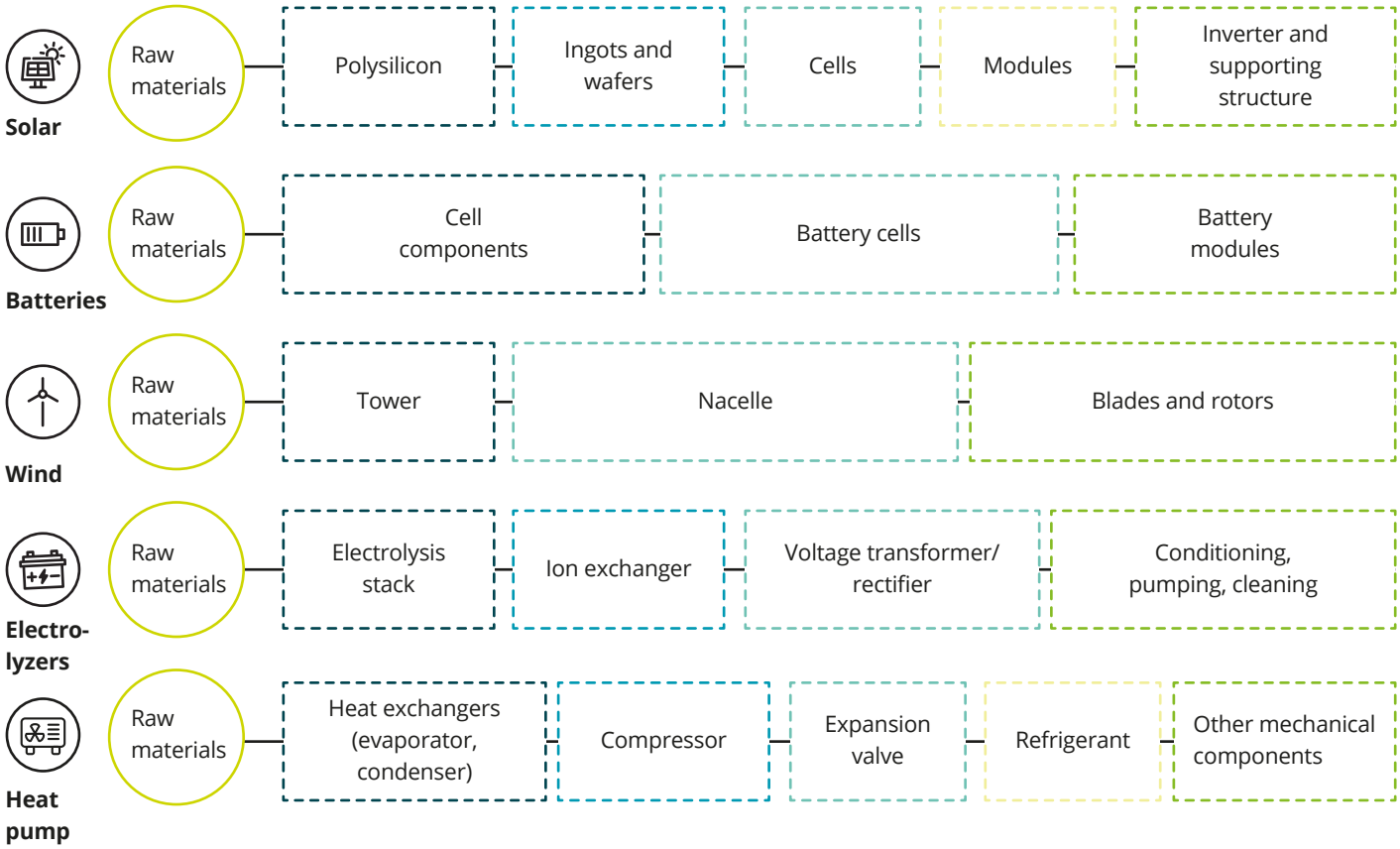
[33] Tagliapietra, Veugelers, Zettelmeyer(2023), "Rebooting the European Union's Net Zero Industry Act", Bruegel Policy Brief

[34] These technologies are presently: solar photovoltaic and solar thermal technologies; onshoreonshore wind and offshore renewable technologies; batterybattery/storage technologies; heatheat pumps and geothermal energy technologies; electrolyzerselectrolyzers and fuel cells; sustainablesustainable biogas/biomethane technologies; carbon capturecarbon capture and storage (CCS) technologies; and gridand grid technologies.

[35] European Commission, 2023, Proposal for a Regulation of the European Parliament and of the Council on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act), COM(2023) 161 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0161

[36] European CommissionCommission, 2023, ibid.

Fig. 18 – Green manufacturing value chains. key elements of net zero technologies



Source: Deloitte

Getting priorities right: More focus on resilience instead of protectionism

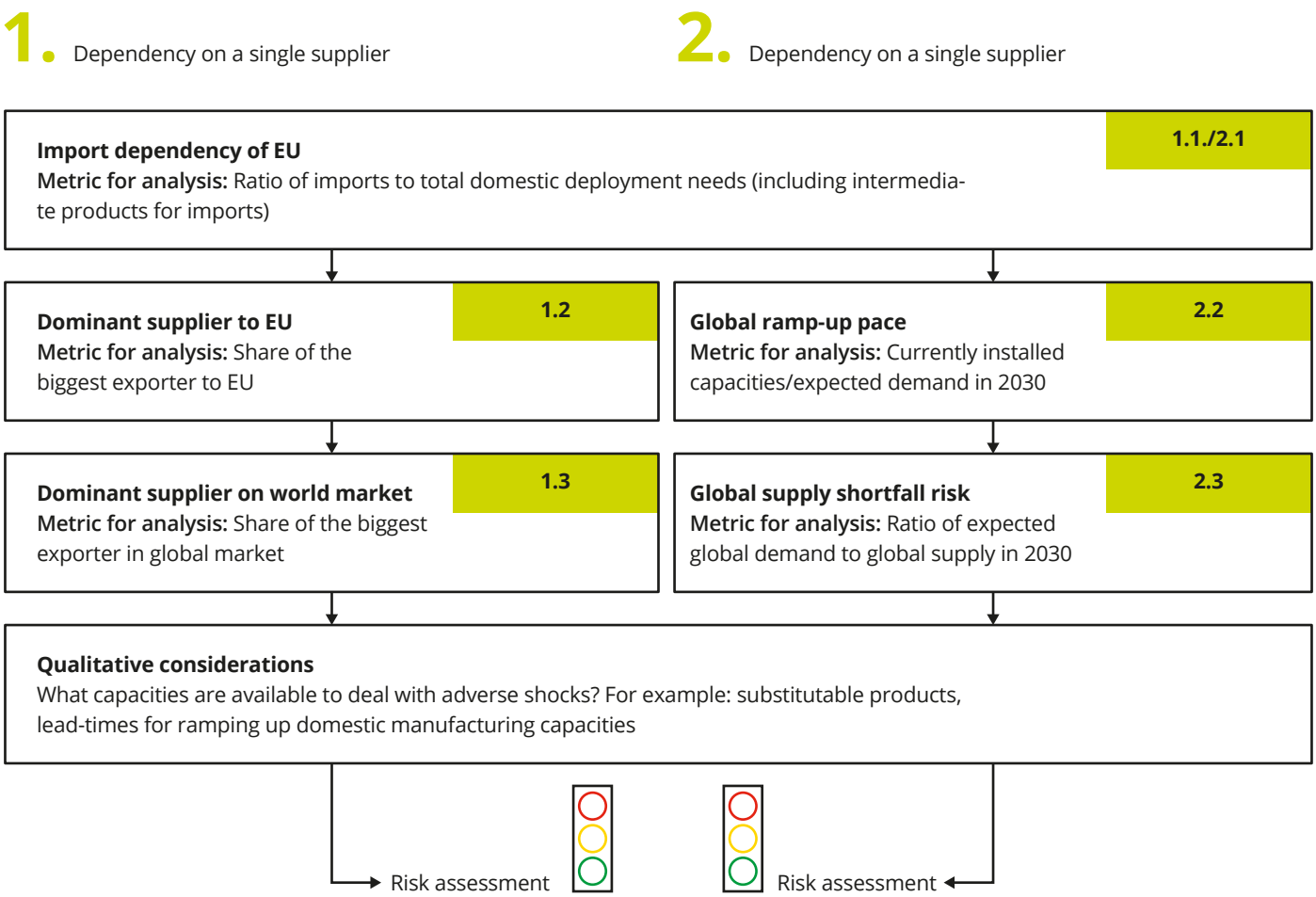
A better approach for a resilience policy for the EU should start with a clear focus on its principal aim of resilience: ensuring the reliable and cost-effective availability of critical equipment for the green transformation of the EU's industry and further economy. This aim should be corroborated with further considerations, in descending order of priority:

- Commitment to free trade: Resilience does not imply protectionism. International trade with reliable and diversified partners allows benefiting from different comparative advantages and creating welfare gains for all involved partners.
- Technological sovereignty in green manufacturing: As a form of long-term insurance, the EU should ensure that it has up-to-date technological knowledge for all relevant elements of vital value chains producing investment goods for the decarbonized era ahead.
- Protecting competitive EU sectors against unfair competition: There is a case for explicitly supporting EU production where relocation of production away from the EU is incentivized solely by subsidies from other countries.

Targeted resilience policy should focus on the weakest links of value chains

To implement a resilience policy, risks need to be systematically assessed at the level of value chain elements before instruments can be designed to specifically address individual types of risk. Focusing only on the final products can lead to overlooking risks in upstream value chain components. But a value chain is only as resilient as its weakest link. Solar modules cannot work without wafers, nor can heat pumps without heat exchangers or compressors.

Fig. 19 – Risk assessment framework schematic



Source: Deloitte

Considerations for a risk assessment framework

A risk assessment framework should provide a comprehensive understanding of vulnerabilities and potential points of exposure. To this end, each relevant value chain element should be analyzed for two types of resilience risk:[37]

1. Dependency on single supplier countries: Overwhelming and non-substitutable dependency on a single supplier exposes destination markets to economic and political shocks in or from the single supplier country.

2. Global supply risks: As several green manufacturing value chains are subject to large and extremely fast ramp-ups of required manufacturing capacity, there are risks that global supply may fall short of global demand.

In both cases, high import dependencies in the final product of the value chain or upstream elements render the EU most at risk. Supply shortfalls are also possible domestically in the EU. But the risk is much higher that in the event of a substantial global supply shortfall, importers will be left with either insufficient or exceedingly expensive imports as producers require larger shares of their production to satisfy domestic demand. We have sketched analytical steps of a risk assessment framework for the green manufacturing value chains (excluding critical raw materials) in Figure 19.

[37] Energy Transitions Commission (2023) identifies another risk dimension in environmental and social concerns. FollowingFollowing the logic of this studystudy, these concerns are to be dealt with by separate policies outside the resilience policy.

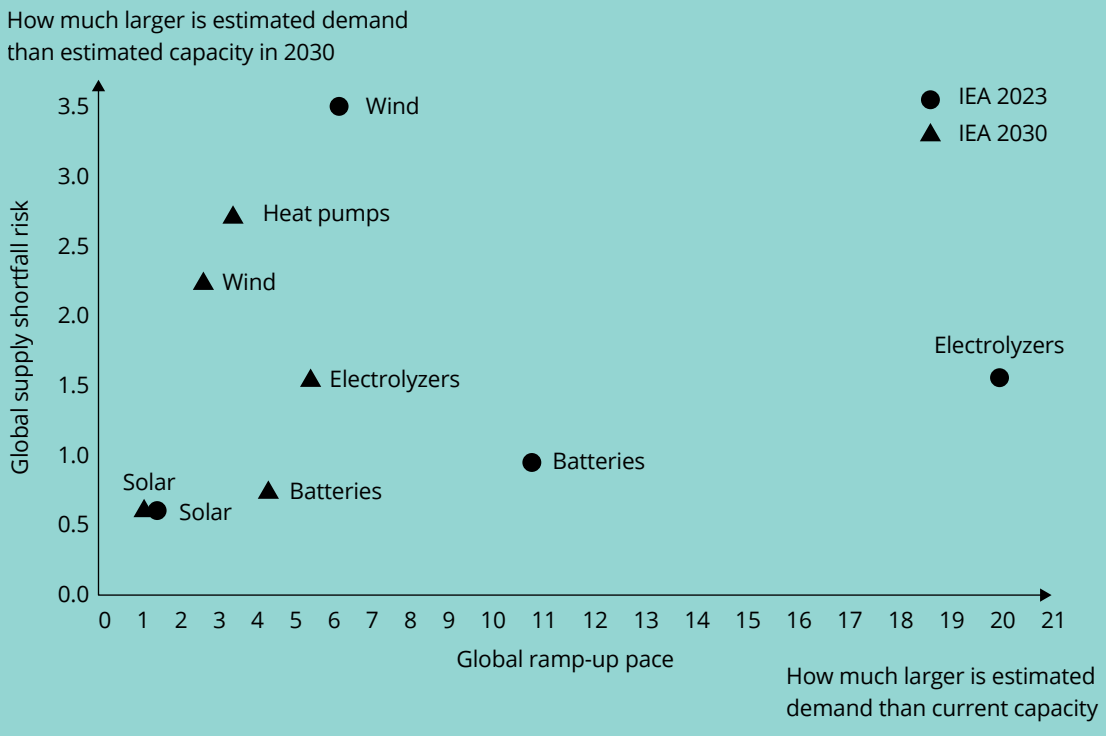
Such a risk assessment could qualify risks in the two dimensions per value chain stage in a three-stage setup of low, medium and high. The import dependency of the EU should determine the maximum risk assessment; if import exposure is low, overall risk due to single suppliers or global supply must also be low. The two next quantitative stages jointly determine overall risk intensity in case of a substantial import dependency. A qualitative assessment of substitution and risk mitigation options completes the picture.

Risk assessments of green manufacturing value chains to date will suffer from insufficient systematic data availability (production per country, trade data) for the specific goods produced by the respective value chain elements. Along with developing and finalizing risk assessment methodologies, better coverage of this important data by official statistics should be ensured.

Global supply risks: Illustrative overview for final products

Figure 20 provides an overview of the resilience risks the EU might face at the level of final products in the two analysis stages specific to global supply risk. This should be extended to each value chain stage once comprehensive data is available. A high data point on the vertical axis indicates that expected demand for the final product exceeds current and planned capacity in 2030. A high value on the horizontal axis indicates that 2030 demand will exceed present market volumes by multiples. A low global supply risk would mean a data point in the bottom left corner. Only two technologies appear in a good or very good position to meet demand in 2030: solar and batteries. Some caution is still advisable, especially for batteries, as a significant ramp-up is required and most plants are only at the planning stages. Most other technologies are risky due either to planned capacities being substantially below required capacities in 2030 or to the high global ramp-up pace.

Fig. 20 – Global supply risks by its two main dimensions



Source: Deloitte, based on IEA, 2023, The state of clean technology manufacturing; ETC, 2023, Better, Faster, Cleaner: Securing clean energy technology supply chains.

Policy instruments for a targeted resilience policy

Two broad categories of policy instruments to implement a targeted resilience policy should be distinguished: instruments aimed at increasing resilience in the context of international trade, and instruments aimed at increasing EU production in the respective value chains. Instruments at Member State level would be inferior to those at EU level as they would lead to fragmentation within the EU and improve resilience only for the Member States executing them.

International instruments can increase resilience for the EU by diversifying its global suppliers, building more robust relationships with individual trading partners, and contributing to the global supply ramp-up. The main types of potential instruments in this regard are:

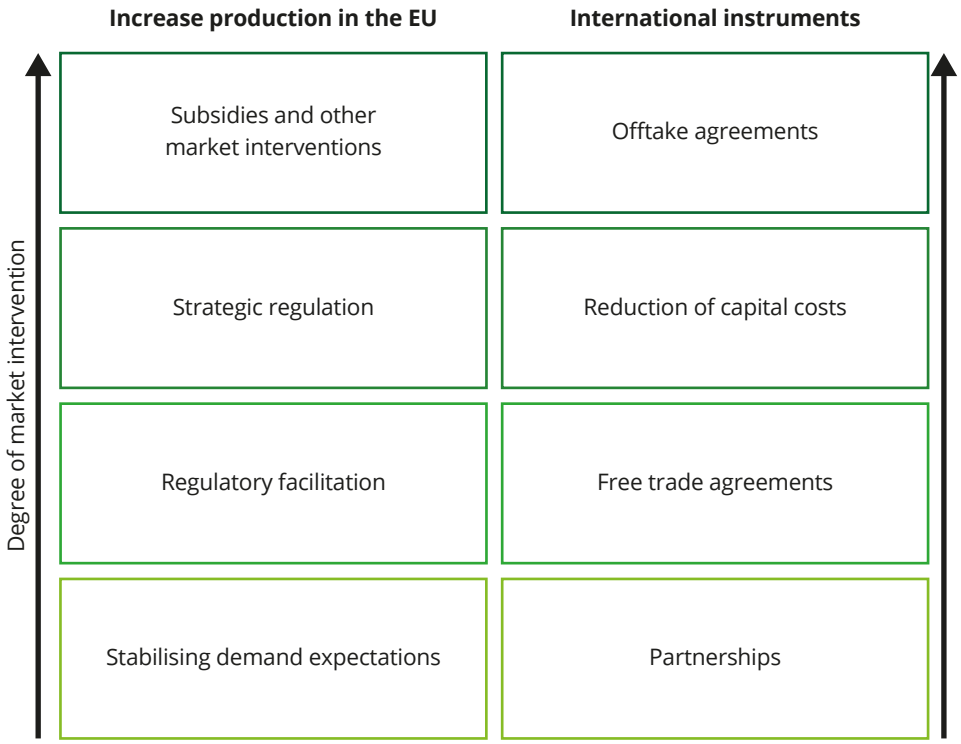
- Partnerships: Including policy dialogues and delegation visits, partnerships with potential supplier countries can help forge trade relations. The NZIA foresees "Net Zero Industrial Partnerships".[38] Germany's energy partnerships, e.g., with Australia, already include the objective of increasing linkages in the green energy value chain[39].

- Free trade agreements: Reducing tariffs between the EU and potential supplier countries and potentially harmonizing product standards will allow the EU to deepen trade relations in goods covered by the FTAs.

- Reduction of capital costs: Investments in third countries are often made difficult by high costs of capital. Using vehicles such as the European Investment Bank (EIB) to provide credit at better rates could accelerate investments in production capacities in green manufacturing value chains.

- Offtake agreements: The EU could theoretically even strike deals to commit to purchasing volumes of green manufacturing or intermediate products to address value chain weaknesses. While member states have concluded such agreements for energy supply (e.g., Germany's LNG deal with Qatar), international offtake agreements for manufactured products have not yet been seriously discussed.

Fig. 21 – Policy instrument options to increase resilience



Source: Deloitte

Potential instruments to increase production in the EU are:

- Stabilizing demand expectations: Providing more anchored expectations of demand for green manufacturing products can substantially stabilize production. This can be achieved by formulating and substantiating clear aims for the energy transition, and decarbonization of industrial value chains, transport and the building sectors.

- Regulatory facilitation: As intended in the NZIA, facilitated approval processes for new products or investments can help overcome obstacles to investment in the EU.

- Strategic regulation: EU production can be favored over imports by tweaking standards or public procurement rules. Also, local content rules can be attached to new or existing forms of downstream support measures (as done in the IRA) at the cost of potential infractions of WTO rules. The difficulty with this instrument is that it will mostly play out at Member State rather than EU level.

- Subsidies and other market interventions: EU production in green manufacturing can be incentivized by offering explicit production subsidies in different guises or guaranteeing the offtake of products. For the reasons given in the previous section, if utilized, this should be done at EU level and using smart, market-based instruments.

[38] Existing EU's current programsprograms (Global Gateway, Sustainable Investment Facilitation Agreements) could also be extended to promote developing value chain links with attractive potential supplier countries in green manufacturing value chains

[39] Bundesministerium für Wirtschaft und Klimaschutz, 2023, Deutsch-australische Energie- und Klimakooperation soll verstärkt werden. https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2023/01/20230127-deutsch-australische-energie-und-klimakooperation-soll-verstarkt-werden.html

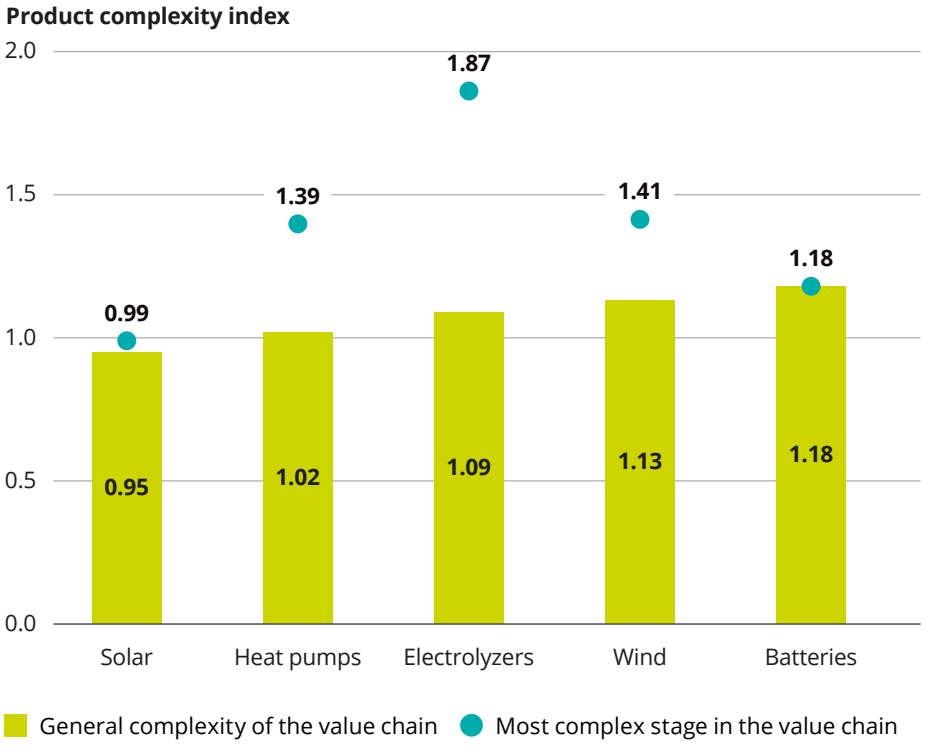
Matching instruments and risks

The crucial decision is when "international" instruments can be used, and diversification and increasing the robustness of international suppliers is the best move, as opposed to when production capacity in the EU should be strengthened to increase resilience. Clearly, instruments with a smaller degree of market intervention should preferably be used and options exhausted before heavier calibers of instruments with more distortive potential and higher fiscal risks (such as subsidies or public offtake agreements with international suppliers) are used. Importantly, instruments need to be calibrated at the level of value chain elements, depending on the results of the risk assessment.

To decide which sort of instrument is appropriate at which time, the risk assessment needs to be coupled with an analysis of the competitiveness of EU production in each respective value chain stage. The analysis can be a guide as to whether increasing production capacity in the EU is only an expensive fallback option if resilience cannot otherwise be achieved, or an attractive option requiring only the removal of obstacles or a temporary matching of distortive subsidies by others. This requires a modelling of production costs in EU countries and third countries at the level of technologies, considering the different cost components of each product (e.g., inputs, energy, labor, capital) and prices for these components in the EU vs. other potential suppliers – excluding any distortive subsidies used abroad. In general, products that are capital intensive should be more feasible for competitive EU production than labor-intensive products. Equally, high energy intensity would on average reduce the competitiveness of the EU to produce a good.

The modelling should be complemented with a systematic analysis of the technological complexity of a product, as this is clearly a comparative advantage of the EU. Figure 20 shows an analysis of the complexity of selected green value chains. The height of the bar indicates the overall complexity of a value chain, while the value of the dot represents the complexity of the most complex element of the value chain. Overall, the complexity index ranges from -3.37 to 2.31. Hence, a value of 1 on this scale indicates a medium to high complexity level. The complexities of the portrayed value chains vary around the value of 1, with solar showing the lowest and batteries the highest overall complexity of their value chain. It is interesting to note that the electrolyzer value chain includes the most complex element across all presented value chains: ion exchangers.

Fig. 22 – Product complexity of green manufacturing value chains, 2021



Source: Deloitte, based on Harvard Growth Lab Product Complexity Index, The Atlas of Economic Complexity.

Broadly speaking, using the "international" instruments to increase diversification should be the preferred way to increase resilience when the resilience risk originates in dependency on a single supplier and EU production of the good is uncompetitive. Diversifying production to other suppliers unlikely to be affected by shocks to the current single supplier should be sufficient to increase resilience and make for cheaper investment goods than could be produced in the EU.

Similarly, if there is a strong global supply risk and EU production is deemed to be potentially competitive, production in the EU should certainly be incentivized. In the case of global supply shortfalls, import dependencies are an economic vulnerability. If a global supply risk and a single supplier dependency exist for the same value chain stage, the instrument choice should generally follow the global supply risk.

The two nuanced cases are as follows: In case of a single supplier risk and competitive EU production capability, both import diversification and strengthening of EU production capacity are feasible. If the sector is deemed very attractive for EU production, for instance because of the potential for highly productive jobs etc., the obstacles to EU production should be addressed and overcome accordingly, if necessary, by matching subsidies of competitors.

The less desirable case is one in which there is a global supply risk and EU production of the respective product is deemed not to be competitive. In this case, all import sources bear a certain risk that in the event of a market crunch, contracts may not be honored, and products may become scarce for the EU. A good balance between developing "robust" import sources and a base EU manufacturing, albeit expensive, needs to be struck.

Fig. 23 – Mapping policy instruments to risks and eu competitiveness

	Dependency on a single supplier	**Global supply risks**
EU production competitive	EU production and/ or diversification	EU production
EU production uncompetitive	Import diversification	Robust import diversification or EU production

Source: Deloitte

No-regret and insurance policies
Two policies should be pursued independently of individual value chain stage risk considerations:

1. **Stabilizing demand expectations for green manufacturing by ensuring consistent development of the green transformation in the user sectors:** Hold-ups, such as in the deployment of renewable energy due to permit issues for sites have played a role in the offshoring of the solar industry. This needs to be improved. Ensuring that the deployment of the user sectors of green manufacturing – from the build-up of renewable energy generation via installations of heat pumps in housing, transformation of industrial sectors towards hydrogen usage and manufacturing of battery electric vehicles – follows an ambitious and reliable path is essentially a no-regret policy accelerating both the green transformation of the EU and the consistent development of competitive value chains in green manufacturing.

2. **Ensuring a minimum production capability in the EU in critical value chains is required for technological sovereignty:** Even in value chain stages in which the EU does not hold comparative advantages but where the technology is not trivial and expertise is not widespread, a minimum production capability should be maintained in the EU to ensure that if circumstances change drastically, the EU at least has the technological know-how available to scale up production capacities in the medium term.

Actionable insights

The targeted resilience policy should address the weakest links within green manufacturing supply chains, based on a systematic risk assessment: Attention to individual stages of the supply chains is required to avoid missing out vulnerabilities by only looking at final products. A systematic, data-driven risk assessment should be developed that separately considers two main dimensions of risk: Global supply risk as the ramp-up of global supply may fall short of global demand and dependency on a single supplier.

The results of the risk assessment and an evaluation of the competitiveness of EU production should guide the choice of policy instruments for the at-risk stages of supply chains: In case of single supplier dependency and uncompetitive EU production, instruments for increasing the diversification of the EU's imports such as partnerships, free trade agreements or capital cost support in third countries should be used. In the case of global supply risks and competitive EU production, instruments supporting more EU production should be used. The potential of less market-distorting measures such as stabilizing demand expectations, or regulatory facilitation should be exhausted first before moving to more distortive measures. In the other two combination cases, a mixture of instruments should be used. If a global supply risk and a single supplier dependency exist for the same value chain stage, the instrument choice should generally follow the global supply risk.

Stabilizing demand expectations and safeguarding minimum production capability in critical value chains are no-regret policies. Ensuring a consistent development of the green transformation in user sectors such as the deployment of renewable energies has not been successful in the past but could stabilize supply chain development in the EU. And supporting minimum production capacities in the EU would safeguard technological sovereignty in non-trivial parts of supply chains.

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