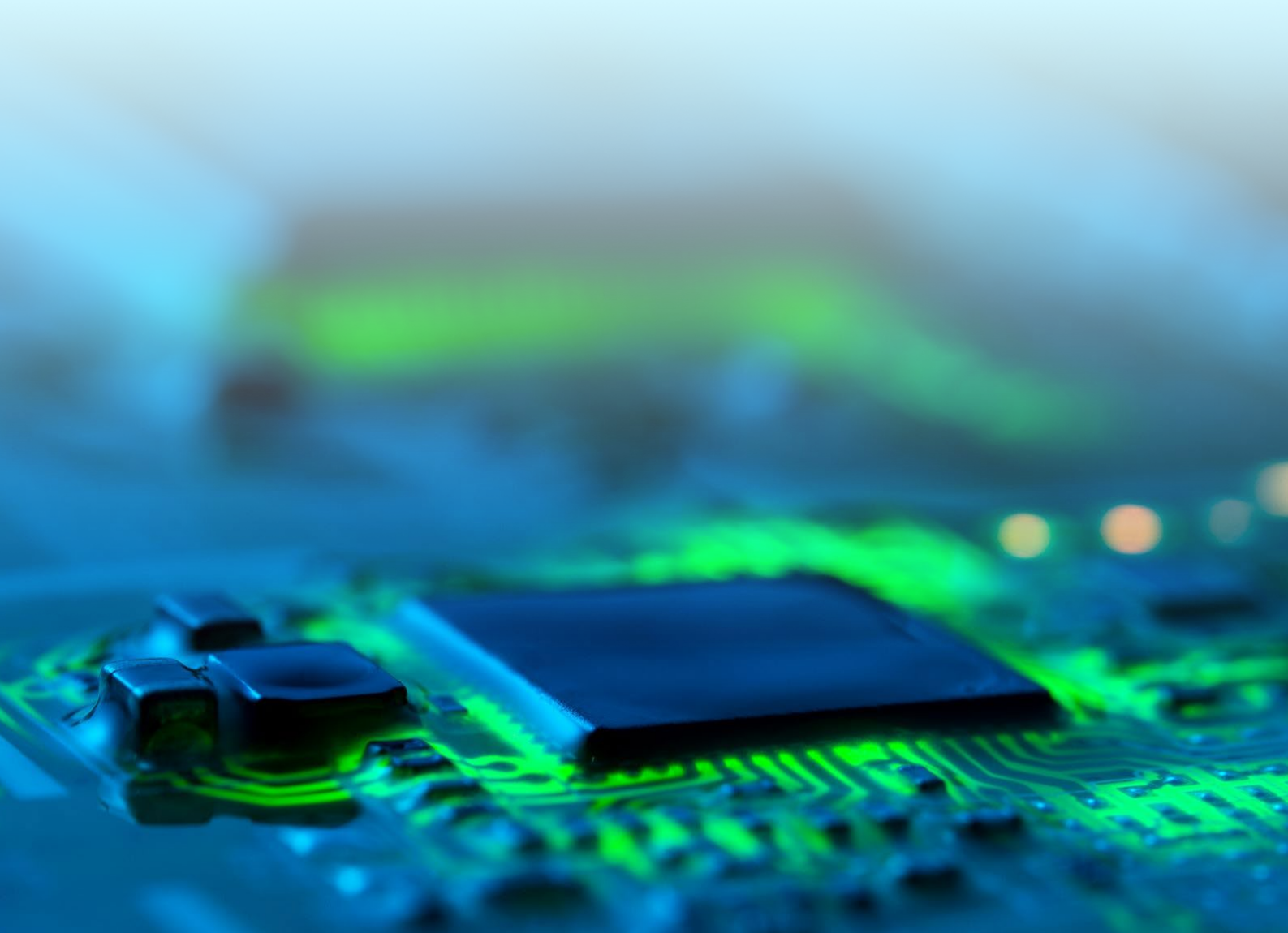
ecno
European Climate Neutrality Observatory

Briefing:

Is European cleantech on track for net zero?

A question of finance



Key Messages

Cleantech solutions will be key to achieving climate neutrality in the EU by 2050, but the European Climate Neutrality Observatory (ECNO)[i] found that progress in clean technologies has been too slow, according to dedicated quantitative indicators. The transformation of research into patents and innovative start-ups requires more action, including on financing. To bridge the financing gap for cleantech start-ups, EU financial instruments are vital. While private investment in cleantech is on the rise, it must further increase to realise the EU's ambitious manufacturing goals, with public finance playing a pivotal role in scaling up manufacturing and attracting private capital.

In analysing data associated with ECNO's three enablers for cleantech, as well as supporting data points, this paper examines the current state of EU cleantech from lab to market. Three key insights arise:

- **The EU boasts a world-leading research infrastructure,** which is the foundation for its future cleantech leadership. However, more action is required to **transform research into patents, and then into innovative start-ups.**
- **Launching innovative cleantech start-ups requires significant investment.** While the EU has a healthy and growing venture capital ecosystem to provide the necessary seed funding, the private sector is not investing sufficiently to support the needs of the sector. **EU financial instruments such as the Innovation Fund are necessary tools to bridge this financing gap.**

[i] European Climate Neutrality Observatory, 2023

- **Private investment in cleantech, and particularly more mature technologies, is at record levels.** This is a positive signal for the future growth of the EU manufacturing base. However, if the EU manufacturing is to reach the ambitious scale envisioned in the Commission's Net Zero Industry Act, even more investment is required. **Public finance should here play a significant role in scaling-up manufacturing and creating an attractive investment environment for private capital.**

ECNO was launched as an independent progress tracking initiative in 2023 to help the EU achieve climate neutrality by providing scientifically rigorous analysis of economy-wide progress and an impartial check on EU climate policy processes. Rather than only tracking headline targets, ECNO looks under the emissions curve by analysing enabling conditions, or enablers, of the transition.

In the first flagship report, ECNO analysed progress in 13 sectoral and cross-cutting building blocks of a climate neutral future, one being clean technologies. The analysis showed that so far progress in clean technologies has been too slow overall.

Cleantech – a crucial building block towards climate neutrality

To successfully steward the transition to climate neutrality, policymakers and society more broadly need a clear view of where current progress stands. To help fulfil this role, the European Climate Neutrality Observatory (ECNO) tracks progress on decarbonisation through scientifically rigorous analysis of thirteen critical building blocks.

One of these building blocks is cleantech: the wide range of "clean" or "green" technologies which have an important role to play in decarbonising the economy. These technologies are not limited to the well-known spheres of energy (solar PV, heat pumps) or mobility (batteries for electric vehicles), but cut across all sectors of our economy, including food (alternative proteins) and construction (green steel and low-carbon cement).

Achieving the EU's medium-term goal of 55% emissions reduction by 2030 will depend largely on deploying these technologies at scale, requiring an increase in Europe's domestic manufacturing capacity. However, simply building up manufacturing for cleantech that is on the market today will not be sufficient to reach net zero by 2050 and mitigate some of the worst potential consequences of climate change. Doing so requires the development of innovative technologies that still require research and development, first of a kind demonstration, and commercial scale-up[ii].

[ii] IEA, Net Zero by 2050: A roadmap for the global energy sector, 2023

The following sections will examine the results of the ECNO indicators which cover data relevant to each stage of a technology's development, and dive deeper into the dynamics and barriers to progress facing European cleantech.

Progress on cleantech: From research lab to factory floor

Europe's world-class research ecosystem is the foundation for cleantech leadership

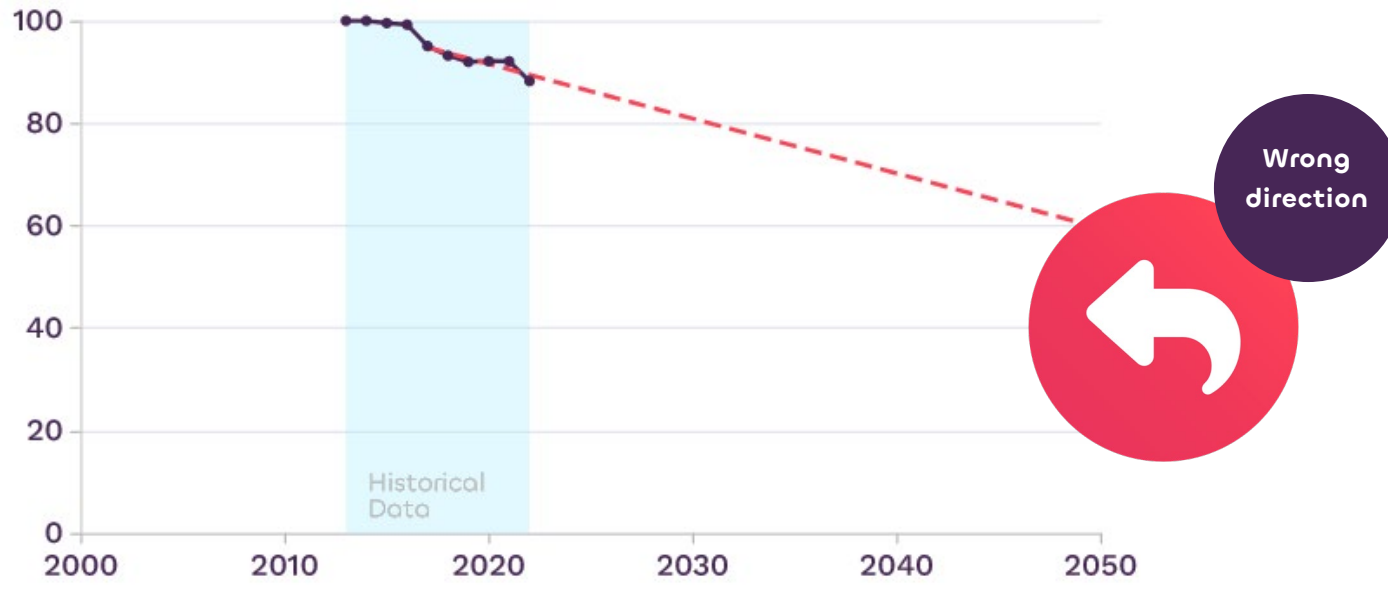
The foundation of the current global cleantech landscape is its lively research ecosystem. Europe is in a strong position to contribute to that ecosystem, with its world-class research institutions and 7% of the planet's population contributing almost 30% of its knowledge generation[iii]. In the field of cleantech, this advantage should be utilised to the full if the EU is to contribute to its own and the world's decarbonisation.

ECNO's analysis shows that while the research on clean technologies in Europe remains active, with the number of related academic publications increasing, it is not resulting in an increase in patent activity (figure 1).

[iii] German Federal Ministry of Education and Research, The European Research Area: Enabling joint research and joint growth, 2023

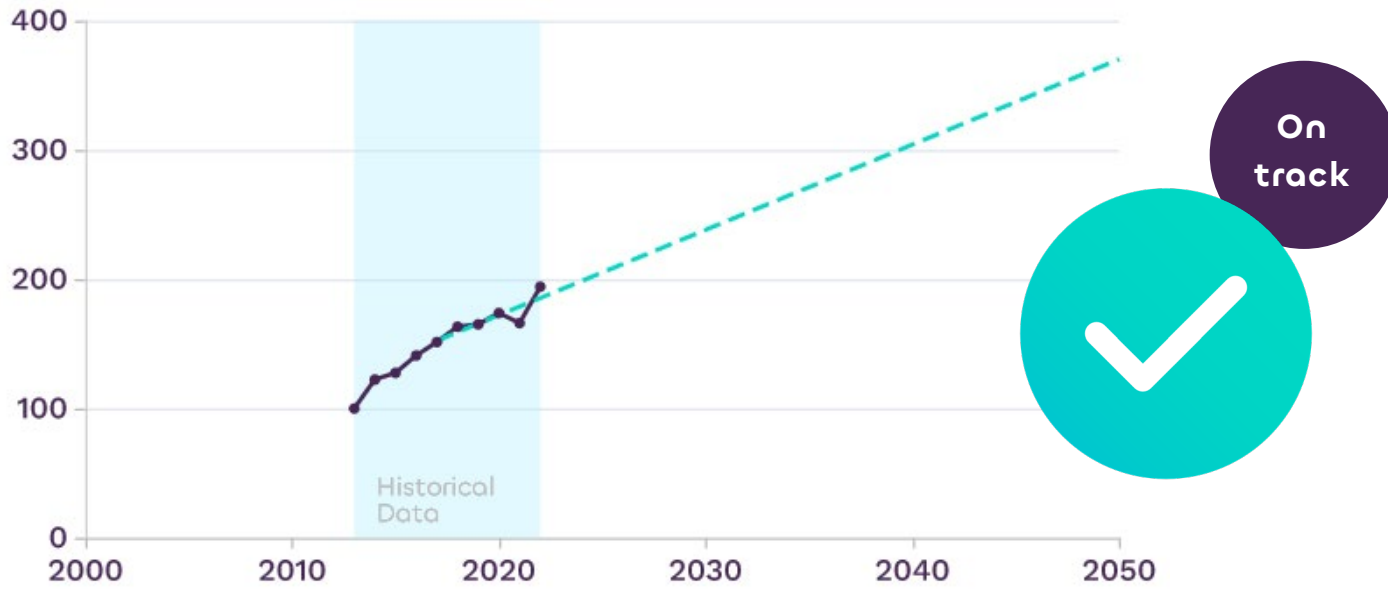
Figure 1: Indexes of eco-innovation related publications and patents

Index of eco-innovation related patents [% change]



Source: ECNO

Index of eco-innovation related publications [% change]



Source: ECNO

This highlights a dynamic of a lowering capacity to transform research excellence into patent activity, the latter of which is the bedrock of cleantech progress further down the value chain. This slowdown is negative for the progress towards climate neutrality, as, according to the IEA, cleantech innovations will need to be brought to market faster than ever if the world, and therefore Europe, is to meet its decarbonisation goals[iv].

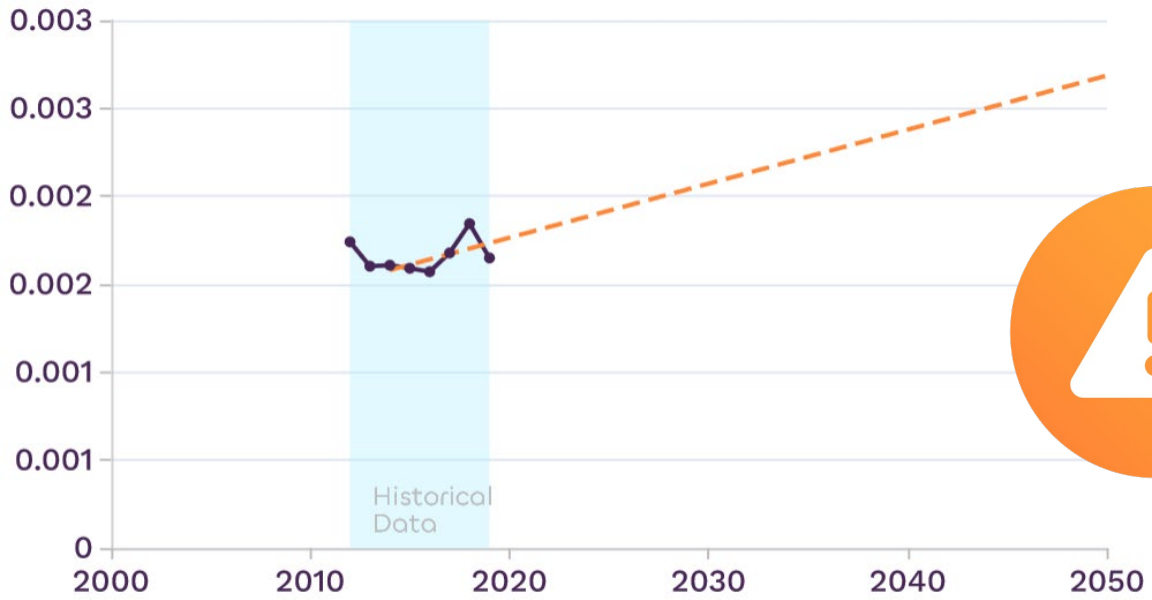
To improve the connection between research and the cleantech market outside of the doors of Europe's universities, the EU and Member States can develop a more targeted strategy to support the development of cleantech patents[v] and increase the connection with the private sector through partnerships and financial support agreements[vi].

Transforming research projects into cleantech start-ups requires significant financing

Above all, bringing cleantech from the lab to market requires significant private and public funding. Private finance should ideally be able to take promising innovations through from prototype to commercial demonstration, early market adoption and wide market success - although, as it stands, there is not enough funding available, with venture capital and other private sources unwilling to accept the risk profile and high upfront capital costs associated with cleantech projects. This is evidenced when examining recent trends in EU private energy and R&I spending, a key indicator in ECNO's cleantech analysis. Progress on this indicator has been far too slow and is not sufficient to keep pace with the transformation required.

[iv] IEA, Energy Technology Perspectives 2023, 2023
[v] Joshua B. Powers, Patricia P. McDougall, University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship, 2005
[vi] Gans, Hsu and Stern, When does start-up innovation spur the gale of creative destruction?, 2000

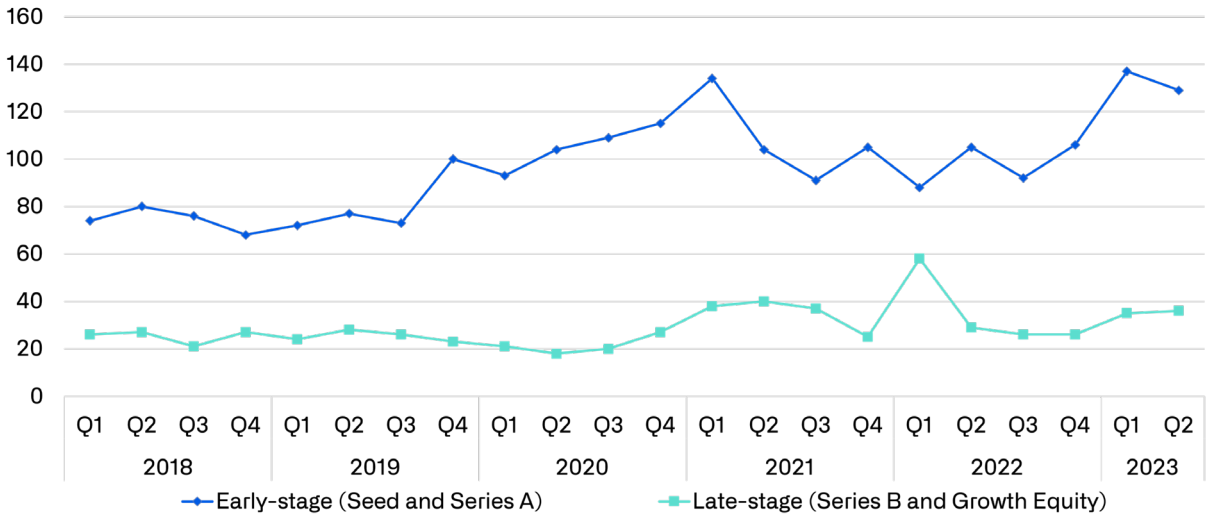
Figure 2: Private energy R&I spending [% of GDP]



Source: ECNO

Further down the technology development scale, as research projects transition out of prototype and are taken up by start-ups for further development for market, innovators will look to venture capital as their primary source of private finance, particularly Seed and Series A funding. While data on the scale in euros of this round of financing has not been disaggregated from overall start-up funding (including Series B and Growth - see Section 3.4 for more), when looking at deal volume, we can see that these early-stage deals, while trending upwards, are also increasing at too slow of a pace (figure 3).

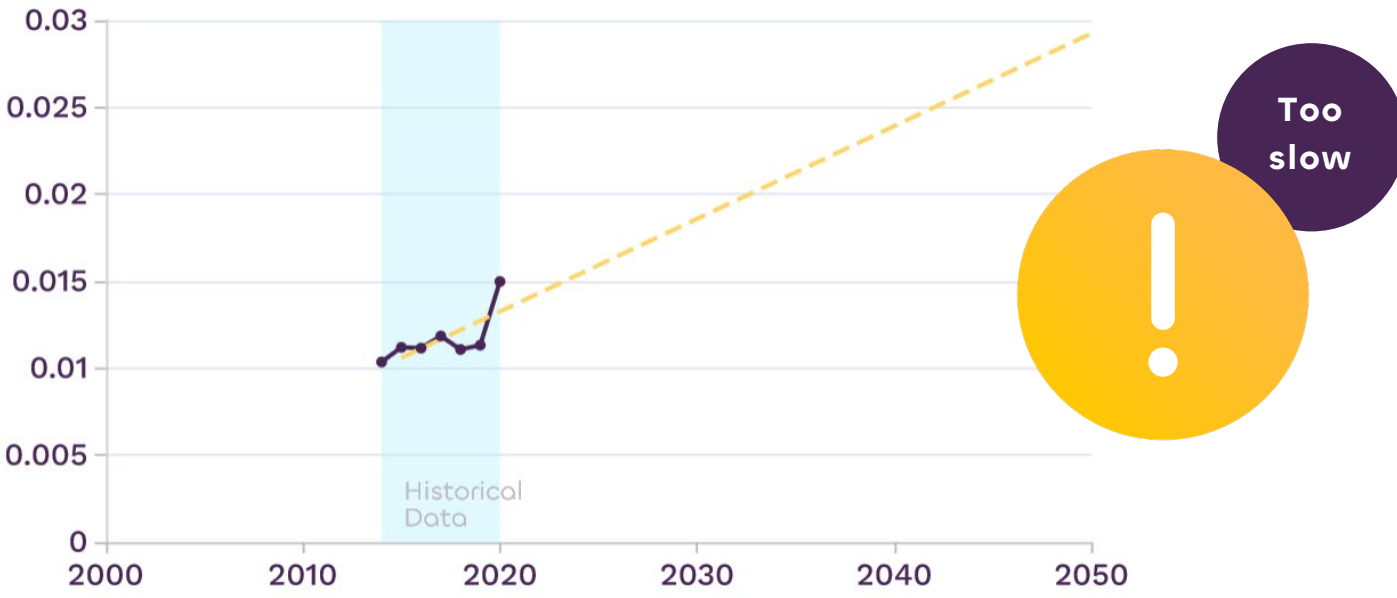
Figure 3: EU Cleantech Venture and Growth Deals by Stage



Source: Cleantech for Europe

This poses a problem for EU cleantech, as it means that projects face a "valley of death" as they leave the lab, due to a shortfall in private R&I and venture funding. At this stage, a start-up will seek to launch a pre-commercial demonstration (or pilot) project, to prove the viability and future market acceptance of the technology - but may be delayed or blocked from doing so due to the drop-off in finance. This is where public funding has a role to play, by financing commercial demonstration of projects which are promising but have not been adequately financed. Unfortunately, public funds for such R&D have only shown an average annual increase of 4.6% between 2015 and 2020 and are therefore not expanding at the pace required to make up the shortfall, further slowing the growth of European cleantech (figure 4).

Figure 4: Funds allocated to energy R&D by governmental sector [%of GDP]



Source: ECNO

There are, however, some signs that this trend may improve in future. Take, for example, the EU's Innovation Fund, the EU's largest climate fund made to support the commercial demonstration of green innovation projects. Unlike many EU funds, which are funded by the EU budget, the Innovation Fund is funded by an allocation of EU carbon allowances under the EU's Emissions Trading System (ETS), which are then auctioned on Europe's carbon market to raise capital for the Fund. This means that an increase in the ETS price in the future would result in a larger allocation to the Innovation Fund, as I4CE projected in a paper from 2023[vii].

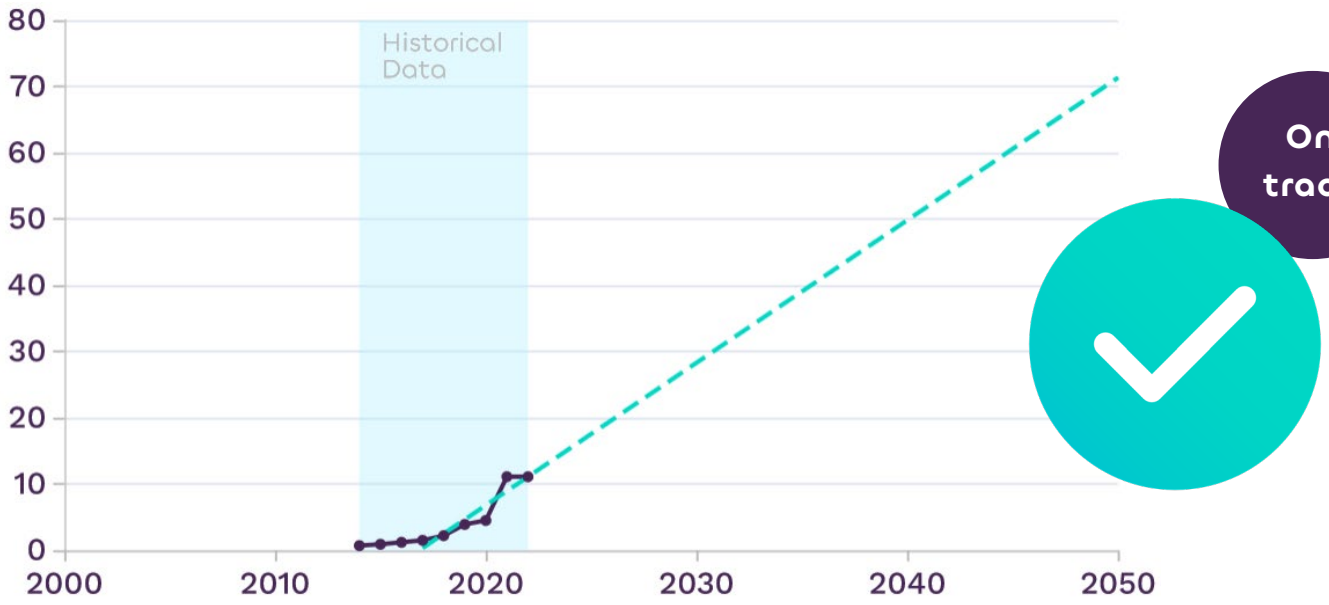
According to this projection, based on a Bloomberg forecast of a 2030 ETS price of €147, the size of the Innovation Fund in that year is expected to reach €27.1 billion, compared to the 2023 size of €3.6 billion. Such an increase in size would have a significant impact on future public support available to address the "valley of death" facing cleantech start-ups as they leave the lab and try to enter the market.

[vii] I4CE, The Sharpest Tool in the Box: how to strengthen the Innovation Fund for climate, competitiveness and security, 2023

Cleantech is a growth industry, but more support is needed to reach the EU's goals

When considering how the EU is to meet its 2030 decarbonisation target, analysing the growth of Europe's manufacturing and deployment of more mature cleantech is crucial. Here, the private finance picture looks positive, with investments into cleantech increasing on average 101% annually between 2017 and 2022 (figure 5) - demonstrating both increased investor interest in the sector and the rapidly expanding size of the market. 2021 saw an increase of €7.5bn invested over 2020, for a high point of €12.3bn overall, while 2022 saw a slight drop to €10.6bn.

Figure 5: Private investments in clean technologies [€bn]



Source: ECNO

However, this positive trend is no call for complacency - when examined in the global and political context of cleantech investment, there is still room for improvement. Firstly, this positive upward trend is a global, rather than a European, phenomenon, and when compared to other large global markets, the EU private capital stack is somewhat smaller[viii]. This disparity threatens European cleantech progress, as more vibrant private capital ecosystems in other jurisdictions will attract European innovators to relocate outside of the EU, slowing progress towards increased capacity of the European cleantech industrial base.

Furthermore, the EU's own goals as far as cleantech manufacturing should be incorporated into this analysis – as they set the benchmark for the bloc's cleantech ambition. A current focus of EU policymaking has been building up EU cleantech manufacturing, in the face of increasing competition from the US (through, most notably, the Inflation Reduction Act) and China, as well as other large economies. There is also a need to build up manufacturing to a level which can ensure the resilience of the EU cleantech industry, whose strong material dependency on China could pose a problem if current geopolitical and trade tensions spill over into a conflict.

To address these dual competitiveness and resilience challenges, the EU has proposed its Green Deal Industrial Plan, which includes a relaxation of state aid rules (Temporary Crisis and Transition Framework), the Net Zero Industry Act (a regulatory framework setting targets for EU manufacturing and accelerating permitting timelines, among other provisions) and the Strategic Technologies for Europe Platform (a funding mechanism for strategic technologies, including but not limited to cleantech).

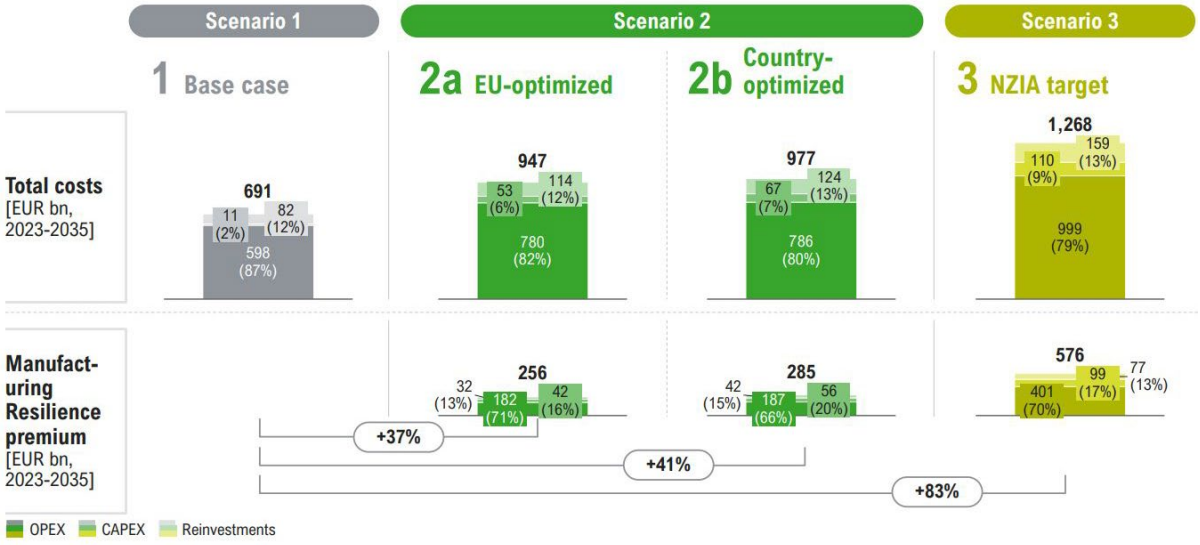
Therefore, it is important to track cleantech investments against the investment needs to achieve those goals. Recent Agora Energiewende modelling[ix] projects the base case of current investment trends out to 2035, to show the size the industry

[viii] Cleantech for Europe, EU Cleantech Annual Briefing, 2022
[ix] Agora Energiewende, Ensuring resilience in Europe's energy transition: The role of EU clean-tech manufacturing, 2023

is likely to reach if current trends continue. It then compares this base case to the investment needs of a European cleantech industry of a size that will ensure supply resilience (scenarios 2a and 2b) or reach the goals as set out by the Net Zero Industry Act (NZIA, scenario 3) (figure 6).

To achieve the NZIA scenario, investments would have to increase 83% against the base case. This means that private investment will have to increase if late-stage EU cleantech is to deliver the competitiveness and resilience which policymakers increasingly demand. Judging by historical trends, private investment cannot be expected to fill this gap alone, and therefore it is important that innovative public financing solutions are developed to make up for any shortfall and ensure the accelerated expansion of the industrial base.

Figure 6: Overview scenario results - Total costs & resilience premium [cum. EUR bn, 2023-2035]



Source: Agora Energiewende/Roland Berger

Conclusion – How public finance can supercharge EU cleantech ambition

EU cleantech is in a good position. With a world-class research infrastructure, dynamic start-up scene and growing industrial base, the signals that the industry will play a significant role in Europe's decarbonisation are strong. However, the pace of growth could improve, with a lack of finance at different stages of the technology development process posing a stumbling block. Whether it is in bringing innovations from the lab to commercial demonstration or scaling more mature innovations to industrial scale and building up manufacturing capacities, a lot more will need to be invested to keep cleantech on track in its valuable role of delivering climate neutrality, economic competitiveness, and energy security.

This is where public finance has a role to play - both in bridging the "valleys of death" which cleantech innovators face through the technology development cycle, and in derisking investments to crowd-in more private capital which may be initially wary of the high upfront capital costs and risks associated with cleantech projects.

Some Member States are already stepping in to fill the gap. Take, for example, Germany's climate tax credit of €7 billion, or France's announcement of a €2 billion green industrial tax credit. However, many Member States, with greater fiscal constraints, are not able to match this support.

This is where European-level support is vital. The EU already has some powerful tools at its disposal, from the EU Innovation Fund to EIB mechanisms such as venture debt. The challenge for policymakers is how to better finance and target

those existing financial instruments to support EU cleantech, and ensure the sector is on track to play its part in delivering EU decarbonisation from now until 2050, and beyond.

To truly unlock the potential of European cleantech at every stage of development, policymakers should:

- Develop a European approach to support the transition of innovative research technologies into the market.
- Empower research funds such as Horizon Europe and early-stage public support to start-ups (such as EIB venture debt) to ensure innovative technologies reach the market quickly.
- Target the Innovation Fund to increase the number of cleantech demonstration projects in Europe and support the scaling-up of manufacturing operations.
- Coordinate, target and increase the size of a range of EU and Member State public funds to support manufacturing and deployment of mature technologies.

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