

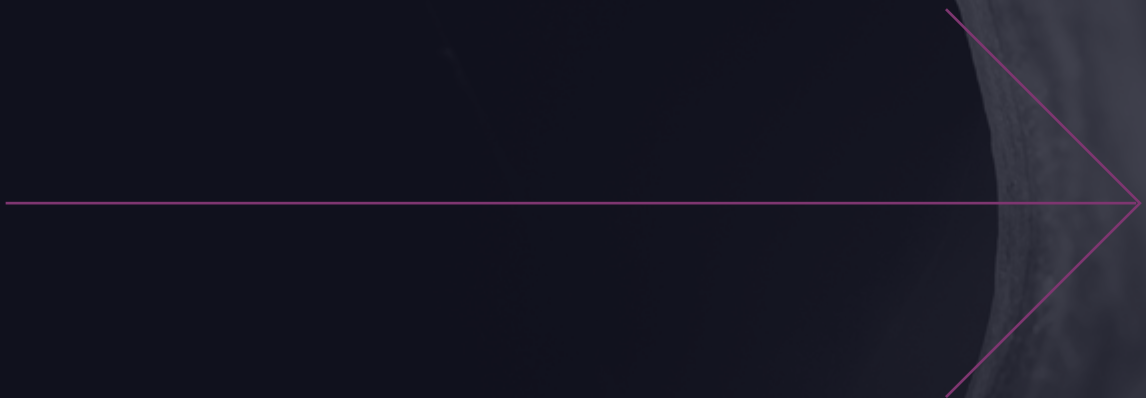
climate tech

for a Sustainable Planet

Quarterly review
N°7 — 2023

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FOR TOMORROW

Perspectives from Capgemini





Cyril Garcia

Head of Global Sustainability Services and Corporate Responsibility, Capgemini

Cyril Garcia was appointed Global Sustainability Services and Corporate Responsibility Head on January 1st, 2023. He is responsible for the integration of sustainability across Capgemini's portfolio of client services, as well as driving the Group's own sustainability agenda. Cyril is also responsible for Capgemini's Corporate Social Responsibility activity. Cyril has been a member of the Group Executive Board since 2018.



Florent Andrillon

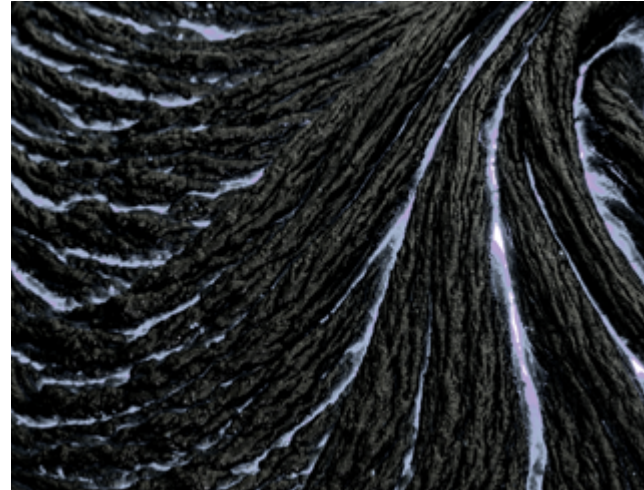
Climate Tech global lead, Capgemini

Florent leads in bolstering the Cleantech business development with all sustainability teams across the Group and he has more than 20 years of experience in the energy and utilities sector, helping clients to achieve their sustainability goals and transition to a low-carbon economy. He has a strong focus on the energy, resources and cleantech market, as well as on sustainability, climate and energy transition issues. He leverages the capabilities of the Capgemini and its external partners to deliver innovative and impactful solutions.

WHY CLIMATE
TECH IS
PIVOTAL TO
ACHIEVING A
SUSTAINABLE
PLANET

CLIMATE TECH, TOWARDS A LOW- CARBON INDUSTRIAL REVOLUTION

We have less than seven years to halve global greenhouse gas (GHG) emissions and reduce methane emissions by a third if we are to limit global warming to 1.5°C.¹ To get there by 2030, we need to go beyond incremental innovations and behavior change. We must make systemic changes in technologies, institutions, and practices on a huge scale. We need a new industrial revolution.



The Climate Tech landscape

Climate Tech players are tackling the challenge from multiple angles. They are working to:

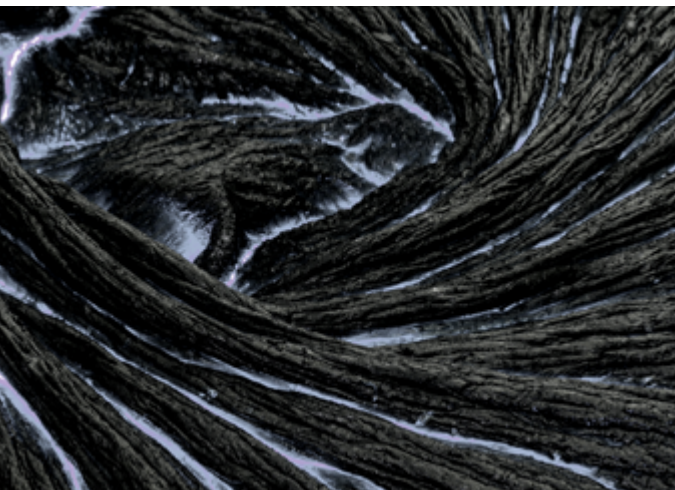
- Reduce CO₂ in the atmosphere with renewable energy sources such as wind and solar, energy-efficient building and transportation, and carbon capture/storage technologies.
- Help us adapt to climate change through, for example, sea-level-rise protection and drought resistant crops.
- Reduce agriculture's impact on ecosystems through efficient irrigation and precision agriculture technologies.

Synthetic biology also has an important role to play in the climate transition, whether by reducing emissions through circular manufacturing, using bacteria to reduce plastic pollution, or the sequestering

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We need systemic changes in technologies, institutions and practices at a scale comparable with the ones experienced in past industrial revolutions.”

¹ Intergovernmental Panel on Climate Change (IPCC).



"Synthetic biology has an important role to play in this climate transition."

carbon through soil, oceanic, lithospheric, or anthropogenic sinks. And when it comes to hard-to-abate industries, clean hydrogen will help reduce emissions, potentially reshuffling the global industrial landscape.

While most of the technologies we need to reduce emissions for the 2030 target are already available, the path to 2050 relies on newer technologies, particularly in sectors that are hard to decarbonize, such as heavy industry and long-distance transport. To help unleash these technologies and make them more cost-competitive, we must compress the traditional 25-year innovation cycles and accelerate development. This would have financial as well as ecological advantages. An Oxford University research team² found that the faster the transition, the greater the saving (at least US\$12 trillion compared to continuing our current levels of fossil fuel use), as a result of the potentially enormous decline in costs that comes with technology learning.

The rise of Climate Tech

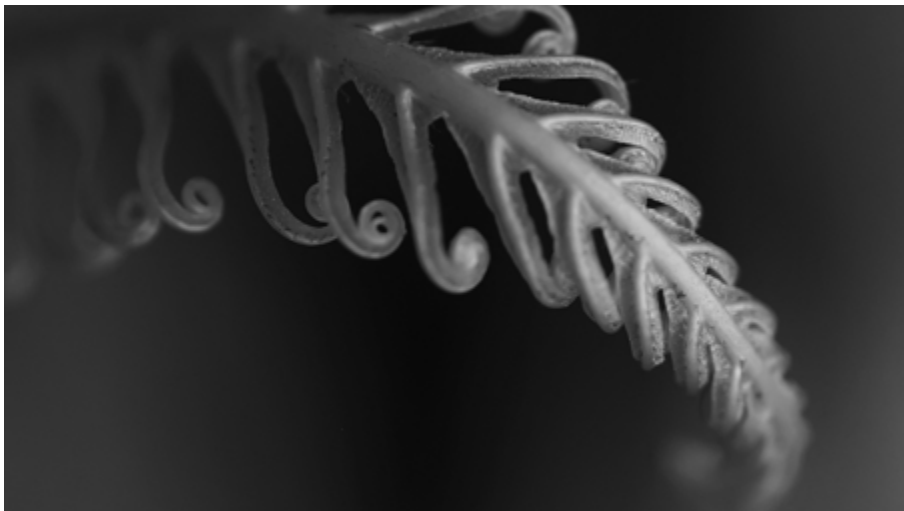
Between 2010 and 2022, the number of Climate Tech firms worldwide rose by over 400% to 44,595. In 2021, Climate Tech companies raised around US\$111 billion – more than enterprise software (US\$104 billion) and only just behind HealthTech and FinTech (US\$ 119 billion and US\$129 billion, respectively).³

While integrating most climate technologies into existing infrastructure, hardware, software, and operational systems may be complicated, there are reasons to be optimistic.

² Empirically grounded technology forecasts and the energy transition, University of Oxford [https://www.cell.com/joule/fulltext/S2542-4351\(22\)00410-X](https://www.cell.com/joule/fulltext/S2542-4351(22)00410-X)

³ Tech Nation, Climate Tech Report 2022, November 2022.

SINCE 2010, THE NUMBER OF CLIMATE TECH FIRMS WORLDWIDE HAS RISEN BY OVER 400%.



Factors helping climate technologies move into the mainstream include:

- **Affordability:** The learning rate for clean technologies to date suggests they can deliver the necessary advances and cost reductions to reach parity with incumbent alternatives.
- **Attractiveness:** Pledges from large organizations to decarbonize their operations and product lines in the effort to reach net zero give confidence to entrepreneurs and backers that there will be strong demand for new technologies.
- **Availability of 'green money:'** There is a notable rise in investments earmarked for sustainability and environmental, social, and corporate governance (ESG) objectives.

- **Policy support:** Governments are lending strong fiscal support to low-carbon innovation and related infrastructure.

A combination of these enabling factors and growing interest in green technologies means that many major climate technologies are now getting closer to their 'tipping point' (the point at which they attain mainstream adoption). See Figure 1.

Figure 1: Hype curve of select climate technologies



Source: SVB, "The Future of Climate Tech", 2022

The need to scale up at speed

The next challenge is scaling new technologies at an unprecedented speed, for which more substantive work, more public support, and more investment are urgently required. The UN estimates that global transformation to a low-carbon economy will require at least US\$4-6 trillion a year until 2030.⁴

There has been important progress in 2021/22, including in R&D in key areas such as low-carbon hydrogen-based steelmaking, small modular nuclear reactors, and lithium-free batteries.

4 UN – COP27, Sharm el-Sheikh Implementation Plan, November 2022

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Governments globally are now actively supporting the industrialization and deployment of impactful climate technologies, with an increasing focus on:

- heavy industry
- green hydrogen
- batteries
- sustainable fuels
- carbon capture, usage and storage (CCUS)
- and other critical energy technologies.



The race to net zero has begun, and climate tech is at its core."

In the United States, for instance, the combined Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act provides ~US\$470B in new energy and climate funding over 10 years. This is more than 3 times the Marshall plan, which provided over \$130 billion (in 2020 dollars) in economic aid to European countries between 1948 and 1951. And this trend is global: the European Union has the Net Zero Industry Act and Critical Raw Materials Act; Japan has a Green Innovation Fund; and China has set strong climate target and investment priorities in its 14th Five-Year Plan.

The opportunities ahead

The race to net zero has begun, with Climate Tech at its core. Those countries that take the lead in speeding up the development of clean technologies could reap considerable economic benefits, including significant job creation. Climate technologies will reshape and in many cases remove the boundaries

"Climate technologies will reshuffle the boundaries between industries and open new frontiers for innovation and growth."

between industries and open new frontiers for innovation and growth. Climate Tech is set to transform the way we interact with the world more profoundly and on a larger scale than the digital revolution. Most businesses will need to integrate new climate technologies into their operations to decarbonize and reduce their environmental impact. This brings with it an incredible range of opportunities for innovation. For example:

- With wider use and distribution of solar, landowning businesses such as retailers could become power providers, or use this renewable energy to charge electric trucks.
- CO₂ captured from an industrial process (e.g. at a cement plant) could become a tradeable byproduct for use in a clean fuel refinery.
- Similarly, carbon removal technologies like biochar are used for CO₂ offsetting, but have the valuable side-effect of enriching agricultural soil.
- Shipping companies or airlines looking to secure their supply of clean fuels could move up the value chain and produce the green hydrogen themselves.

The need for 'intelligent industry'

Intelligent Industry can be a great lever to accelerate the deployment of climate technologies. Climate Tech innovation is distinct from the digital transformation of recent decades. Climate change is, inherently, a hardware problem – it requires large infrastructure projects to transform how our economy operates. While software has its role, and can be a great facilitator of emissions reduction, hardware is essential across all sectors if we are to build a sustainable and habitable society.

Intelligent Industry can provide innovative ways to ramp up climate technologies. **Better data and improved application**, for example, mean more



Climate change is, inherently, a hardware problem which necessitates large infrastructure projects that transform how our economy operates."

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productive use of fewer resources; such as energy and raw materials, less scrap, and a genuine end-to-end product lifecycle. It helps in simulating and understanding the full impact of a product's impact through its usage, as well as its design, manufacture, transportation, and end of life. Digitization also has an important role: , revealing current blind spots through a comprehensive analysis.

Digital twins of wind projects, for example, make deployment easier, faster, safer, and more cost effective. Likewise, Virtual Validation, Generative Design, and AIDevOps can all help the renewable energy industry break technological and performance barriers.

In the fight against global warming, **industrial automation and smart industries** are critical. Digital technology can help climate tech players and leaders in decarbonization replace dirty and high-emitting manufacturing processes with more resource-efficient and environmentally friendly ones. Automation, robots, 3D printing, virtualization, and other Industry 4.0 technologies can dramatically enhance efficiency and economics.

Climate Tech offers incredible opportunities for engineers, data scientists, and business innovators. We need to upskill and mobilize them to work on these challenges now to ensure our future.

The transition to a low-carbon economy is as big as the Industrial Revolution, but we need to deliver it at the pace of the Digital Revolution. Let's act now!





"The transition to a low carbon economy is as big as the Industrial Revolution, but we need to deliver it at the pace of the Digital Revolution."

