In collaboration with Capgemini and
Cambridge Industrial Innovation Policy,
University of Cambridge

WORLD ECONOMIC FORUM

United for Net Zero:
Public-Private Collaboration to Accelerate Industry Decarbonization

WHITE PAPER

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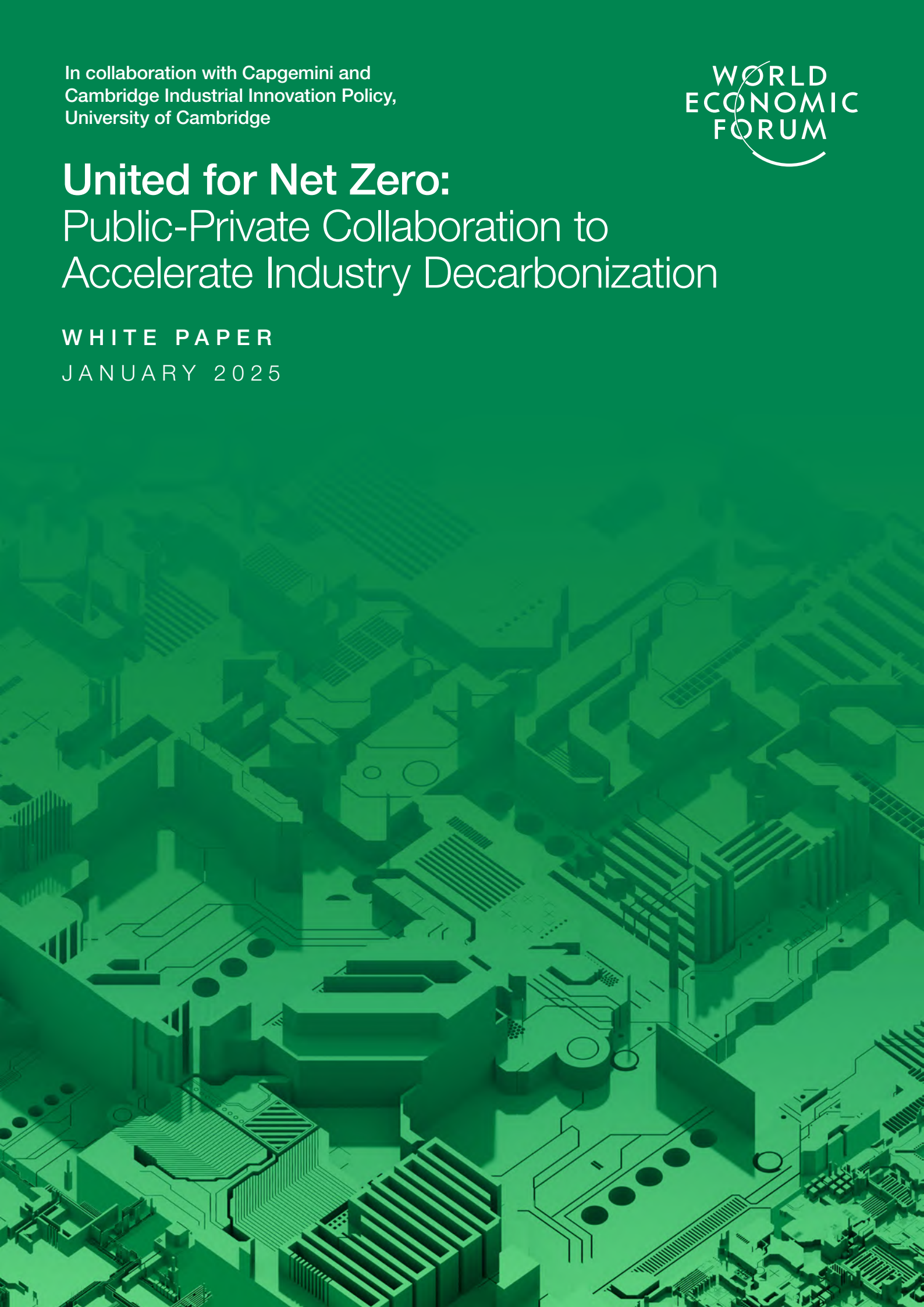

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Contents

Foreword

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Tackling climate change urgently calls for global collective action. Both the public and the private sectors contribute to greenhouse gas (GHG) emissions through their respective operations and influence on the economy. Industries still rely on fossil fuels for energy, production processes and logistics, driving significant emissions, and the public sector is also responsible for major emissions through infrastructure projects, transport and buildings. More importantly, it implements policies and regulations that can either mitigate or exacerbate emissions, depending on how they shape energy use, land development and industrial practices.

Public-private collaboration plays a pivotal role in accelerating the transition to net zero. Both sectors have complementary strengths they can use to mitigate their emissions at scale.

Industry leaders have the power to reduce internal emissions by pursuing energy efficiency, rethinking product design and business models, or supporting suppliers to decarbonize. However, reaching net zero means addressing major barriers such as making positive business cases, tracking carbon emissions throughout value chains, or scaling risky and costly net-zero innovations.

Businesses, therefore, need governments to provide financial incentives, invest in research and development, implement tailored and coherent regulatory frameworks, and encourage sustainable consumption – as seen in the electric vehicles (EV) market. Public sectors, on the other hand, can benefit from a stronger collaboration to tailor policies to businesses' needs, overcome bureaucracy and political considerations, and continue prioritizing decarbonization, especially in times of economic downturns.

Business leaders have the opportunity to proactively collaborate and engage with public stakeholders to shape the conditions for a fair decarbonization of society and the economy.

In 2022, the World Economic Forum launched the Industry Net Zero Accelerator initiative in collaboration with Cambridge Industrial Innovation Policy (Institute for Manufacturing, University of Cambridge), Capgemini, Rockwell Automation, Siemens and Schneider Electric, as well as a community of more than 45 global manufacturing companies, to help accelerate the industry transition to net zero. Following the Forum's 2023 publication of *The "No-Excuse" Framework to Accelerate the Path to Net-Zero Manufacturing and Value Chains* and *The "No Excuse" Opportunities to Tackle Scope 3 Emissions in Manufacturing and Value Chains*, the initiative has conducted over 60 consultations among industry executives, academic experts and government leaders to understand the latest barriers hindering progress to net zero, and the most successful public-private collaboration mechanisms supporting the transition. This white paper introduces a framework with eight public-private collaboration opportunities, serving as a guide for manufacturers looking to engage more effectively with public stakeholders to overcome key barriers to net zero. If united, private and public stakeholders can accelerate the journey towards a sustainable future.

Executive summary

Decarbonizing industry requires business leaders to efficiently cooperate with public stakeholders, combining their respective strengths and influence for a sustainable future.

The opportunity to cap global warming at 1.5°C is rapidly escaping. In this context, the need to accelerate the decarbonization of industry – which represents 30% of global greenhouse gas (GHG) emissions – has never been more critical. Yet the speed and the scale of emissions abatement are insufficient: we are currently witnessing an annual increase of 1.5% in emissions – while a 7% reduction is required to follow the 1.5°C path – and a continuous record of daily temperature anomalies.[1] Although companies across various industries are increasingly addressing this challenge and adopting measures to calculate and reduce their carbon footprint, they still face fundamental barriers. What strategies can industrial companies use to make a strong case for net-zero goals while facing competitive pressures? How they can pinpoint key emissions sources without access to precise product-level carbon footprint data? What are the best approaches to influencing supplier emissions and consumer product use? Finally, how can they accelerate and scale the net-zero technologies essential for decarbonization?

Challenges such as high upfront costs, technological limitations, regulatory uncertainty and fragmented constraints, lack of skilled workforce, insufficient infrastructure, limited access to financing and resistance to change underscore the need for public-private collaboration. Businesses need governments to provide the right conditions to fully realize large-scale changes. Meanwhile, governments need businesses to help shape the industrial policies that alleviate the barriers to faster progress. By working together, governments could provide tailored policy frameworks and incentives, while private companies could drive innovation and ensure implementation. Nevertheless, the way to operationalize this collaboration still needs to be outlined.

Recognizing the need for systemic collaboration to overcome the main barriers to industrial decarbonization, the Industry Net Zero Accelerator initiative has developed a new framework to support manufacturing and supply chain companies in engaging more effectively with the public sector to accelerate towards net zero. This framework, shaped by insights from over 60 senior leaders in sustainability, supply chain, operations and technology across various industries, as well as the public sector, academic and international organizations, outlines eight opportunities for public-private collaboration.

This white paper also presents 11 real-world case studies from early movers that illustrate best practices and successful collaborations from around the globe. These case studies provide tangible examples at two levels of action and address four major barriers that companies face in reaching net zero: gaining buy-in, accurately calculating emissions, implementing mitigation efforts and encouraging green business growth. The case studies also showcase how public-private collaboration can alleviate key obstacles, drive innovation and expedite the transition to a decarbonized industrial landscape.

By informing strategic-level decisions and structuring the dialogue between private and public sector stakeholders, this framework serves as a practical roadmap for businesses looking to engage in public-private collaborations to accelerate decarbonization.

Moving forward, the World Economic Forum will continue to bring together leaders across industries, governments, academia and civil society to exchange learnings, inform decision-making, celebrate achievements and contribute to closing awareness and knowledge gaps. This is paramount to accelerating a united and sustainable path to net zero.

1 Industry net zero: the state of play

The urgency of achieving net-zero emissions has never been more critical, yet the speed and scale of emissions abatement are insufficient.

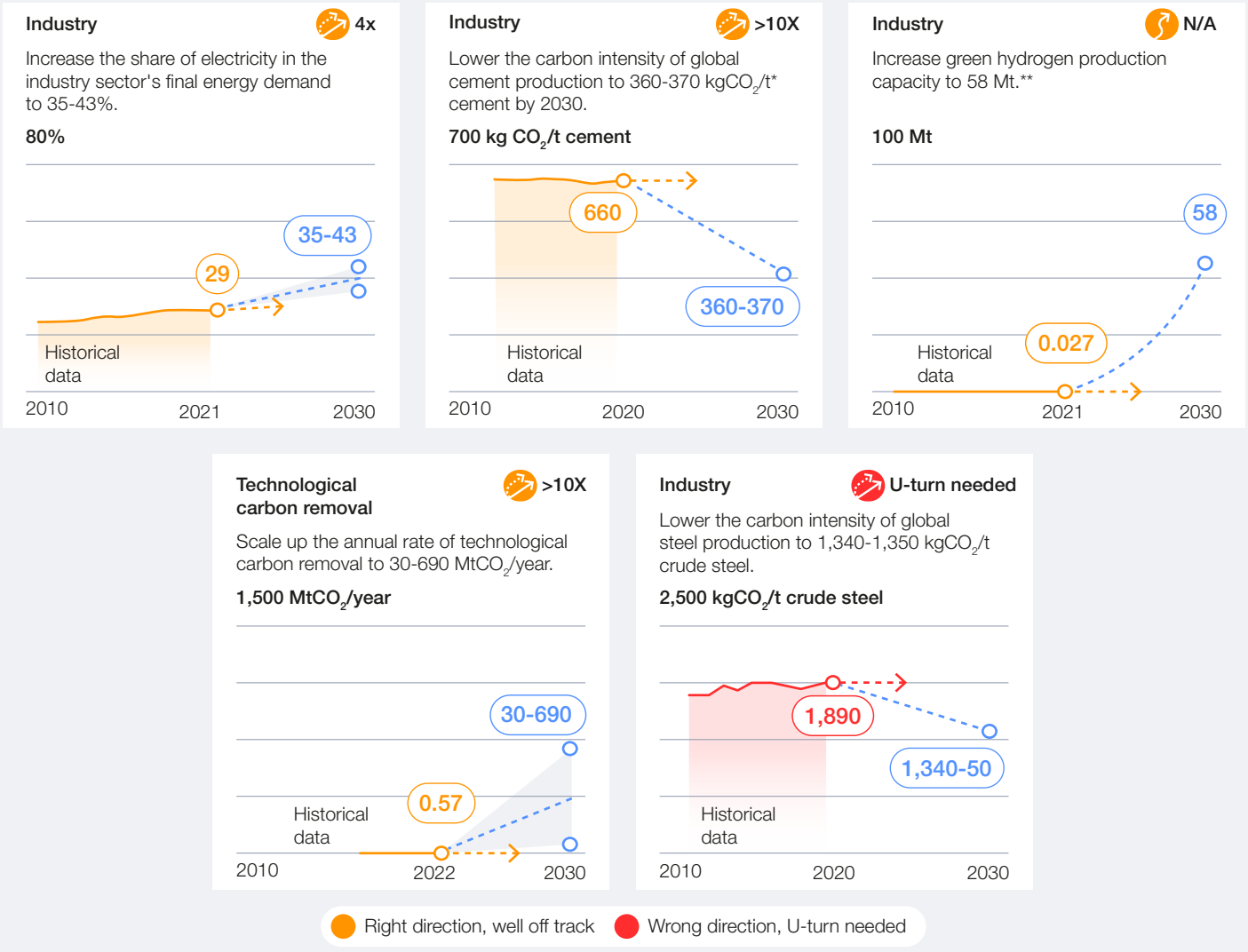
Climate change is proving to be more severe than ever. Recent data shows that global temperatures have reached 1.5°C above pre-industrial levels for the 12th consecutive month as of June 2024 – an unprecedented streak highlighting the accelerating pace of global warming.[2] Additionally, the latest report from the Global Tipping Points indicates that eight critical tipping points are on the verge of being crossed, including the potential collapse of the Greenland and West Antarctic ice sheets, the dieback of the Amazon rainforest, and the thawing of permafrost, all of which could lead to irreversible changes in the Earth's climate system.[3]

The urgency of achieving net-zero emissions has never been more critical, yet the speed and scale of emissions abatement are insufficient. A recent survey involving hundreds of the world's top climate experts revealed that only 6% believe the 1.5°C limit will be met, and almost half predict it will be more than 3°C – a scenario that would take the world to uncharted and perilous territory.[4] Similarly, even if all countries achieved their current nationally determined contributions (NDCs) and net-zero targets for the coming decades, humanity would overshoot a 1.5°C emissions budget by a total of more than 600 gigatonnes (GT) of carbon emissions between now and 2050, leading to warming of 2.5°C by the end of the century. To close this gap, a 7% reduction in emissions must be achieved annually.[5]

What is the state of global industry on its net-zero journey?

Systems Change Lab's 2023 report, State of Climate Action 2023, indicates that the industrial sector's progress towards net-zero targets is markedly insufficient. While there are areas of incremental improvement, such as increased uptake of energy efficiency measures and a gradual shift towards cleaner technologies, the overall pace of decarbonization is far too slow to meet 2030 climate goals.[6] Selected indicators from this report are shown in Figure 1, highlighting that the industry is considerably off-track and likely needs a U-turn to meet 2030 net-zero targets. For example, to achieve the target of a 35-43% share of electricity in the industry sector's final energy demand by 2030, the rate of progress must be four times faster than the rate shown by historical data.

FIGURE 1 | **Assessment of global progress towards 2030 for selected industry indicators**



*Kilograms of carbon dioxide per tonne; **Million tonnes.
Source: Systems Change Lab. (2023). *State of Climate Action 2023.*

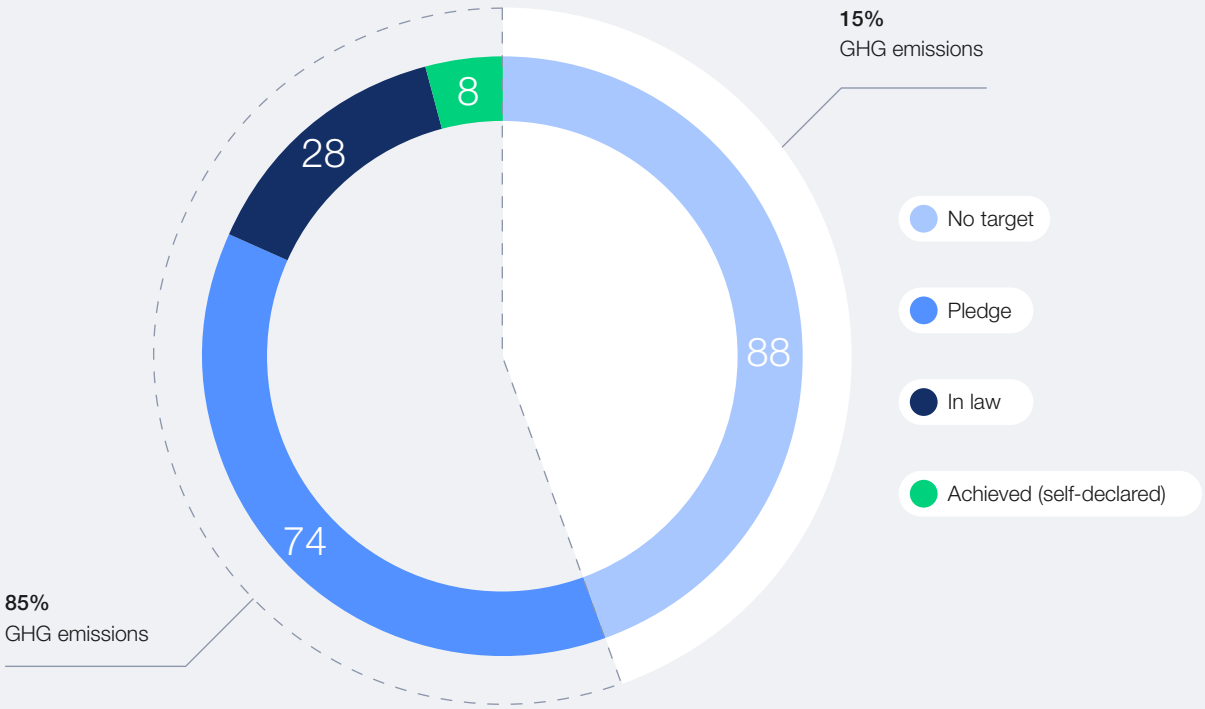
In terms of climate reduction pledges, the Science Based Targets Initiative's (SBTi) *SBTi Monitoring Report 2023* indicates that the global growth in the number of large companies with validated targets continues to increase. The report finds that the total number of companies with validated targets grew from 865 to 1,187 (a 37% increase) from 2021 to 2022, while there were 1,866 in total by the end of 2023 (a 57% increase from 2022). Similarly, 2,253 small- and medium-sized enterprises (SMEs) had an approved science-based target in 2023. Despite the promising trend, these numbers are still low compared to the total global population of companies, representing about 39% of the global economy's market capitalization.[7]

The New Climate Institute's *Corporate Climate Responsibility Monitor 2023,* which assesses the transparency and integrity of 24 major companies' climate pledges and strategies, also found that only a minority of net-zero pledges represent credible commitments to deep decarbonization, while many remain highly ambiguous.[8] In particular, climate pledges for 2030 fall well short of the economy-wide emission reductions required to stay below the 1.5°C temperature limit.

What is the state of public sector action on net zero?

A number of sources dedicated to tracking progress in the creation and implementation of industry-related climate policies highlight progress and shortcomings in various areas. For example, as of March 2024, 110 countries have pledged a net-zero target, with 96 aiming to reach this target by 2050 or before (see Figure 2). Most targets, however, are not legally binding and only 27 countries and the EU, representing 16% of global greenhouse gas (GHG) emissions, have enshrined these into law.[9]

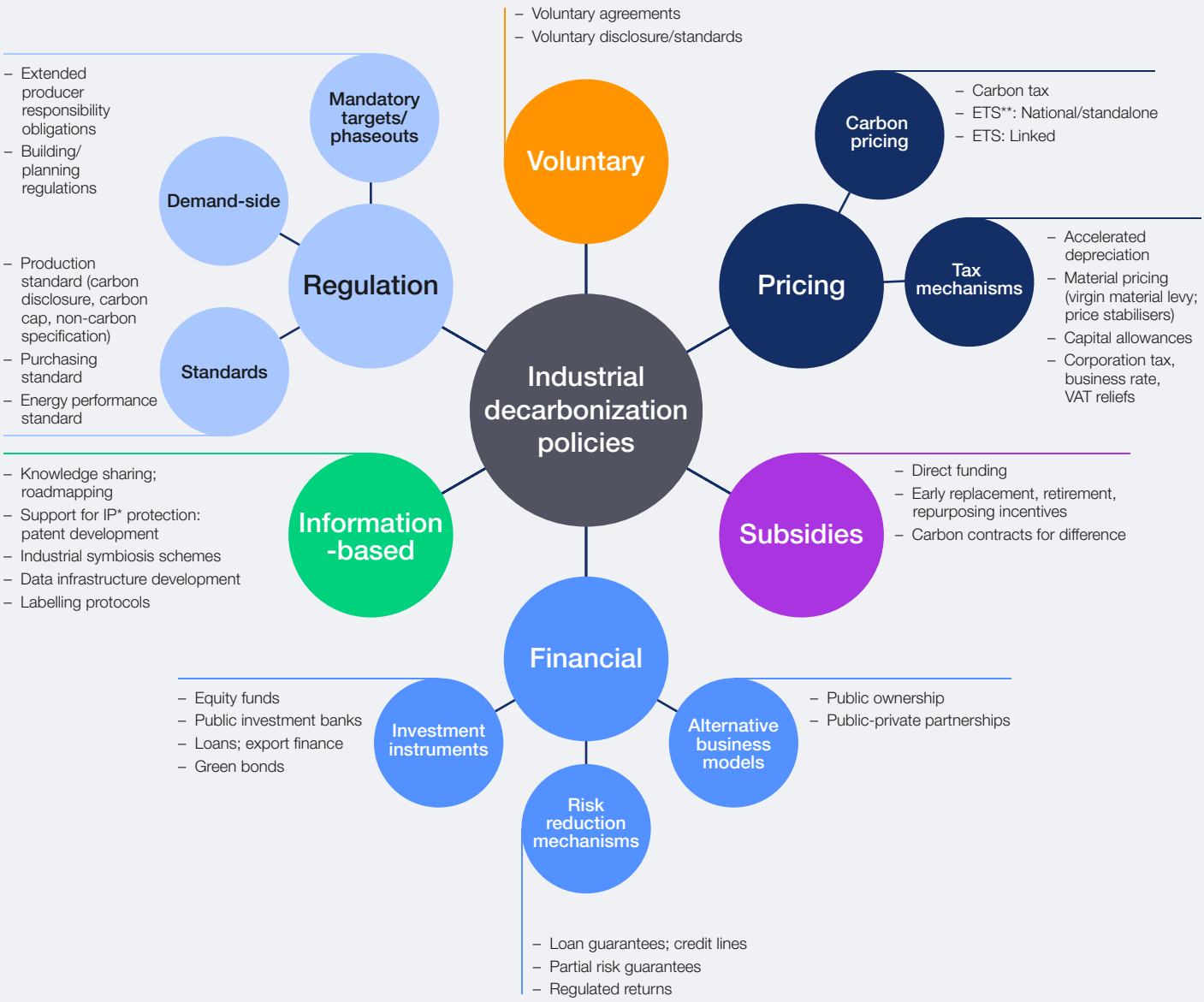
FIGURE 2 | **National net-zero targets: number of countries with a net-zero pledge as of March 2024**



Source: Pizarro, R., S. Sakata, M. C. Rodríguez, A. Z. Aklilu, et al. (2024). *GHG Emission Trends and Targets (GETT): Harmonised quantification methodology and indicators*. OECD Environment Working Papers, no. 230. https://doi.org/10.1787/decef216-en.

At the national and sub-national level, governments adopt a wide range of industrial decarbonization policies with instruments such as regulative measures, information-based initiatives, financial incentives, subsidies, pricing mechanisms and voluntary actions (see Figure 3).

FIGURE 3 | **Current landscape of industrial decarbonization policies**



*Intellectual property; **Emissions trading system

Source: The Centre for Research in Energy Demand Solutions (CREDS), "Briefing: Industrial decarbonisation policies for a UK net zero target." https://www.creds.ac.uk/wp-content/uploads/CREDS-Industrial-decarbonisation-briefing.pdf.

Despite this apparent progress, the Climate Policy Database's analysis of climate policies targeted at industrial net zero in G20 countries shows there are policy areas where significant progress is still needed (see Figure 4). Namely, these policy areas are:

- Support for carbon capture and storage (CCS)
- Support for fuel switching
- Incentives to reduce methane (CH_4) from fuel exploration and production
- Incentives to reduce landfill CH_4
- Incentives to reduce nitrous oxide (N_2O) from industrial processes[10]

Additionally, consultations with industry leaders for this white paper underscored other key policy gaps, including the need for consistent reporting frameworks across geographies and timelines, and more comprehensive incentives for decarbonization within value chains.

FIGURE 4 | **Net-zero policy coverage in G20 countries**

Industry sector

Policy option	Number of G20 countries*	Change activity	Energy efficiency	Renewables	Other low carbon	Non-energy
Strategy for material efficiency	11	Good	NA	NA	NA	NA
Support for energy efficiency in industrial production	16	NA	Very good	NA	NA	NA
Energy reporting and audits	15	NA	Very good	NA	NA	NA
Performance and equipment standards	14	NA	Very good	NA	NA	NA
Support scheme for renewables	13	NA	NA	Very good	NA	NA
Support scheme for CCS	7	NA	NA	NA	Fair	NA
Support scheme for fuel switch	2	NA	NA	NA	Very poor	NA
Carbon dioxide removal technology development	1	NA	NA	NA	Very poor	NA
Incentives to reduce CH_4 from fuel exploration and production	9	NA	NA	NA	NA	Fair
Incentives to reduce landfill CH_4	9	NA	NA	NA	NA	Fair
Incentives to reduce N_2O from industrial processes	3	NA	NA	NA	NA	Very poor
Incentives to reduce fluorinated gases (F-gases)	15	NA	NA	NA	NA	Very good
Overarching carbon pricing scheme or emissions limit	11	Good	Good	Good	Good	Good
Energy and other taxes	10	Good	Good	Good	Good	Good

Countries coverage NA | Very poor | Poor | Fair | Good | Very good

Note: *Including the European Union as a single block

Source: Climate Policy Database.

Lastly, within existing policy mechanisms, challenges remain in their implementation and practical application:

- **Geographical discrepancies and lack of harmonization**: For emerging and developing economies, preserving economic growth is a competing priority while they are facing pressures to decarbonize.[11]
- **Lack of policy effectiveness**: A global evaluation of over 1,500 climate policies implemented between 1998 and 2022 identified only 63 successful policy interventions, reducing total emissions by 0.6 billion tonnes to 1.8 billion tonnes of carbon dioxide (CO_2). Key findings highlighted the important role of price-based instruments, such as carbon pricing, and the need for sector-specific approaches tailored to economic development levels (e.g. provide additional funding for SMEs and improve infrastructure for data collection).[12]

2 Industry net zero: main barriers to acceleration

Barriers to buy-in, calculation, mitigation and green business growth are hindering progress towards industry net zero.

To shed light on the latest challenges hindering progress towards net zero, the Industry Net Zero Accelerator initiative has consulted with more than 60 senior executives in supply chains and operations across industries, and public sector, academic and international organization leaders. The consultations distilled the four areas that still face major barriers. Overcoming the most pressing challenges is paramount to advance decarbonization efforts and underscores the critical need for public-private collaboration (see Figure 5):

1. **Buy-in**: Making the business case for net zero
2. **Calculation**: Calculating carbon emissions accurately
3. **Mitigation**: Supporting value chain decarbonization
4. **Green business growth**: Investing in climate technologies, infrastructure and market creation

FIGURE 5 | **Key barriers to net zero with main associated challenges**

	Main challenges	
1 **Buy-in** Making the business case for net zero	– Insufficient confidence about meeting growth objectives while also meeting net-zero targets – High costs or unclear return on investment of low carbon projects, indicating that net zero must go together with a continued commitment to protect the bottom line – Lack of tax reliefs and capital allowances to support investment in decarbonization solutions	– Need for more demonstrations of the financial benefits of sustainability initiatives (cost savings from energy efficiency, enhanced brand reputation, increased supply chain resilience, etc.) – Struggle to capture and articulate the long-term value of transitioning to net zero while providing short-term shareholder returns
2 **Calculation** Calculating carbon emissions accurately	– Lack of harmonization of carbon calculation standards at product, company and sector levels, varying across sectors and regions; lack of granularity and accuracy – Lack of primary emissions data from suppliers; use of secondary data – High effort and cost linked to reporting and disclosure – e.g. Corporate Sustainability Reporting Directive (CSRD) implementation estimated by $500,000 for the first year	– Economic, technical, legal and regulatory barriers in verification and sharing of product-level carbon footprint across the value chain – Developing economies and SMEs facing notable challenges in collecting, reporting and verifying installation-level data
3 **Mitigation** Supporting value chain decarbonization	– Lack of skills and knowledge, scarce staffing and expertise to create and deliver a net-zero transition plan: e.g. 69% of supply chain leaders do not feel knowledgeable or experienced enough to drive net-zero initiatives – Lack of policies or government-sponsored incentives to support suppliers' net-zero transformation	– Lack of understanding of the alignment between business growth and Scope 3 decarbonization – Large and diverse supplier portfolio, often fragmented across geographies and evolving in various economies with specific regulatory constraints
4 **Green business growth** Investing in climate technologies, infrastructure and market creation	– Reluctancy for businesses to invest in early-stage technologies as a first mover without government support – Limited commercial viability and unfavourable risk-return profile compared to incumbent technologies – e.g. only 4% of proposed low-carbon hydrogen projects currently reach the final investment decision (FID) stage due to costs and lack of demand	– Long permitting processes for renewables and low-carbon infrastructure projects – e.g. average development lead times are currently around 7 and 12 years globally for CO_2 and hydrogen storage – Uncertainty about low-carbon products, sufficient market demand and additional cost cover, especially in the most price-sensitive markets and countries

Sources: Consultations with Industry Net Zero Accelerator initiative's community members; Carbon Trust Net Zero Intelligence Unit. (2024). *Breaking business barriers to Net Zero*; The SustainAbility Institute. (2022). *Costs and Benefits of Climate-Related Disclosure Activities by Corporate Issuers and Institutional Investors*; Capgemini Research Institute. (2024). *A world in balance 2024*; World Economic Forum. (2024). *Bold Measures to Close the Climate Action Gap: A Call for Systemic Change by Governments and Corporations*; Organisation for Economic Co-operation and Development (OECD). (2024). *Towards more accurate, timely, and granular product-level carbon intensity metrics*; Industry Net Zero Accelerator team survey consolidating data from seven large industry events attended by senior supply chain leaders between November 2023 and November 2024, with a total of 669 respondents.

3 Net zero in action: a framework for public-private collaboration to accelerate industry decarbonization

There are eight collaboration opportunities for industrial companies to work with the public sector to overcome net-zero barriers.

Recognizing the need for systematic public-private collaboration to overcome the previously described main barriers to industrial decarbonization, the World Economic Forum Industry Net Zero Accelerator initiative has developed a new framework to inspire strategic-level decisions and structure the dialogue between private- and public-sector stakeholders, thus facilitating further collaboration and accelerating the decarbonization journey.

The framework outlines eight public-private collaboration opportunities that can address the major barriers to net zero outlined in Chapter 2, across two action levers:

- **Action lever 1: Making the most of existing collaboration mechanisms**: actions aiming to increase the adoption of existing collaboration mechanisms for net zero. These can include public funding programmes, carbon calculation standards, net-zero knowledge material, and climate technologies and infrastructure development.
- **Action lever 2: Responsibly engaging in net-zero policies design**: actions aiming to inspire industry leaders to proactively and responsibly engage in collaborative design and build bolder and more robust net-zero policies that can effectively address decarbonization.

To bring this framework to life, the opportunities are illustrated by 11 real-world case studies from early movers that showcase best practices and successful collaborations from around the globe. These case studies provide tangible examples of how public-private collaborations can address key obstacles, drive innovation and expedite the transition to a decarbonized industrial landscape.

FIGURE 6 | **The eight public-private collaboration opportunities to accelerate industry net zero**

Opportunity 1: Understand and leverage public financial mechanisms for net zero

Business investment is critical to delivering the net-zero transition, and government has a crucial role in incentivizing this transformation. Businesses will choose low-carbon alternatives (e.g. materials, products or assets) as they become increasingly cost-competitive and if they are provided with funding opportunities.

Appropriate and tailored incentives from the public sector are expected to ensure decarbonization projects have a sound business case. Typical public support types include:

- **Subsidies**: Direct funding, early replacement, retirement, repurposing incentives, carbon contracts for difference
- **Carbon pricing**: Carbon tax, emissions trading systems
- **Tax mechanisms**: Accelerated depreciation, material pricing (virgin material levy, price stabilizers), capital allowances, corporation tax reduction, business rate and VAT reliefs

Although the level and scale of support varies across the world, collaborating effectively with governments can improve the use of financial incentives and increase confidence and buy-in in decarbonization projects. This approach has been adopted by Edilians in collaboration with Capgemini, which has de-risked its kilns replacement projects through an effective collaboration with the public sector, as depicted in case study 1.

CASE STUDY 1

Edilians and Capgemini efficiently collaborating with the public sector to drive decarbonization

Challenge

Edilians, a European tile manufacturer, identified tunnel kilns as the main source of CO_2 emissions after conducting a carbon assessment. Edilians has outlined a decarbonization roadmap across all its sites to cut Scope 1 CO_2 emissions by 30% by 2030. On top of performance optimization and improvement of its industrial equipment, Edilians identified the development of a new kiln as a critical lever to reach its decarbonization target.

Partnering with an original equipment manufacturer (OEM) that had an early-stage kiln concept promising 30% energy savings, they needed to prove this technology's industrial viability. This required an upfront investment of €10 million with high associated risks and unclear returns on investment and would financially commit the company over 15-20 years.

Solution

To mitigate project risks and unlock external investment, Edilians sought public funding from European and French governments and consulted the French Environment and Energy Management Agency (ADEME), a public industrial and commercial establishment, on its decarbonization funding possibilities.

Edilians and the OEM selected DEMIBaC, a call-for-projects supporting demonstrators of low-carbon production technologies, which provides funding for projects led by partnerships between low-carbon solution providers and demand-side manufacturers. Edilians and the OEM submitted their grant application in 2022, aiming to secure 40% of the investment.

In 2023, Edilians and the OEM secured the grant, receiving €3.6 million to develop the kiln. Edilians then paused its operations for three months and gradually resumed production while performing tests to maintain product quality, which led to lower productivity for that quarter.

Impact

Since then, the company has reduced gas consumption (and, therefore, Scope 1 CO_2 emissions) of its kiln by 33%. Despite the high costs, Edilians plans to annually convert one production line to meet its decarbonization goals. Eventually, Edilians and the OEM aim to share the technology through patent licenses to help decarbonize the sector. In partnership with Capgemini, the tiles manufacturer has deployed its decarbonization plan and has already identified funding opportunities in all its operating countries to de-risk its investments.

Source: Consultation with Edilians and Capgemini; Batiweb. (2024). *-33% CO_2 emissions in an Edilians factory.* https://www.batiweb.com/actualites/developpement-durable/33-d-emissions-de-co2-dans-une-usine-edilians-44963.

Opportunity 2: Engage your sector to co-develop financial mechanisms for net zero

According to the Exponential Roadmap Initiative, industry-wide decarbonization roadmaps are crucial to inform industry and policy decisions. These roadmaps should be developed in collaboration with suppliers, customers and governments and should include financing plans and policies.[13] As significant investment in low-carbon materials and processes is required to accelerate the transition, sectoral roadmaps pinpoint key barriers that must be addressed with policy measures or in public-private collaboration, and ensure mutual understanding and benefits are met. Examples include the United Nations Framework Convention on Climate Change (UNFCCC) textiles charter 11, Fossil Free Sweden's 13 industrial roadmaps and Denmark's Climate Partnerships 2030.

Creating these joint roadmaps also means engaging in responsible climate policy engagement. According to Climate Action 100, only one-third of most emitting companies are committing to conduct their engagement with the public sector for policy design in line with the Paris Agreement.

Case study 2 depicts how a sector (in this case, the UK's logistics sector) proactively informs the government on effective public financial mechanisms supporting their decarbonization.

CASE STUDY 2

UK logistics sector proactively co-developing financial conditions for its net-zero transformation

Challenge

The UK logistics sector, a key economic regional growth driver, faces significant challenges in meeting upcoming net-zero deadlines while maintaining profitability and productivity. The sector must invest heavily to decarbonize while addressing three main challenges: 1) protecting supply chain resilience while preserving service level, 2) unlocking investment for decarbonization, and 3) improving multi-modal transport infrastructure planning and delivery.

Solution

In January 2024, a few months before political elections, Logistics UK, gathering over 21,000 members, released a manifesto calling for public-private collaboration to tackle these challenges and deliver a fair transition to a green economy.

The manifesto highlights key areas for policy collaboration and dialogue creation, including:

- **Shared vision**: Joint work to agree on a consolidated logistics net-zero roadmap, embedding fossil fuels phase out, and based on technology infrastructure investment availability and regulatory reforms and tax incentives
- **Dedicated financial mechanisms**: Tax incentives supporting business investment, including full expensing for capital investments required to update vehicle fleets and fees paid to energy network operators for the necessary upgrades to vehicle charging infrastructure. Additionally, a review of road pricing and fuel duty mechanisms is needed to align with sustainable transport goals.
- **Supportive regulatory framework**: Unified reforms to end the heterogeneous local charges adding inefficiency

Impact

Following the manifesto, both political wings have included logistics sector transformation in their political agendas, reflecting the influence of the industry's unified voice. Logistics UK estimates that partnering with policy-makers could boost economic growth by up to £7.9 billion annually by 2030, driven by productivity gains. The generated impact of the proposed action plans will be measured in the coming years.

Source: Logistics UK. (2024). *Logistics UK manifesto: Unleashing the power of logistics to drive growth across the whole economy.* https://logistics.org.uk/CMSPages/GetFile.aspx?guid=3352c27c-bb9c-4793-9a15-948d0faea40b&lang=en-GB.

Opportunity 3: Facilitate carbon tracking adoption within your value chain

Corporate-, sector- and product-level carbon footprint standards are critical while designing, implementing and evaluating mitigation levers and policies. With the information they provide, they can inform industrial companies' and consumers' decision-making towards low-carbon products, supporting the development of markets for low-carbon goods.

Public-private collaboration can promote the adoption and improvement of carbon calculation methods. It can also increase the harmonization or interoperability of standards to mitigate the impact on business costs (especially for SMEs) and reduce fragmentation across countries and geographies. Collaboration mechanisms include:

- Providing suitable guidance to businesses to report effectively through training and knowledge sharing
- Allocating specific resources to support SMEs and developing countries
- Supporting the implementation of digital tools for the automation of carbon footprint calculation
- Developing novel emissions data collection methods at the installation level. For example, using satellite and artificial intelligence (AI)/ machine learning (ML) technologies to improve the accuracy and completeness of data, or adding low-cost, low-code technology solutions to existing facilities.

Case study 3 depicts how MESS Technology Center (MEXT) engaged in knowledge-sharing initiatives for businesses to improve carbon tracking adoption.

CASE STUDY 3

MESS Technology Center (MEXT) making Turkish industry ready for the green transformation

Challenge

Metal and textile industries in Turkey are large contributors to the country's exports. Both need to continuously increase their competitiveness by addressing challenges like carbon emissions reduction, resource efficiency optimization, or compliance with emerging European and international regulations. This requires companies to strengthen their knowledge in calculating carbon and water footprint and implementing high-impact decarbonization projects.

Solution

To accelerate the decarbonization of these sectors, MESS Technology Center (MEXT) initiated, designed and led a transformation project. The project was in collaboration with the Turkish Confederation of Employer Associations (TİSK), funded by the Danish Ministry of Foreign Affairs via the Danish industry, and involved key public and industrial partners.

The Danish industry brought funding and expertise for European sustainability models and regulatory frameworks; TİSK facilitated industry-wide access and engagement with Turkish industrial sectors; MEXT provided capability building programmes, technical assistance, and a digital platform as a technological backbone; and metal and textile industrials joined and benefited from the programme.

The programme helps manufacturing companies kickstart their sustainability journey through:

1. Online training for increased awareness and knowledge
2. Carbon calculation programmes and focused workshops to build the necessary internal competence for corporate carbon calculation programmes, and focused workshops for carbon accounting internal competence and industry experts' ecosystem development
3. Sustainability maturity assessments unlocking decarbonization strategies
4. A digital platform development embedding industry-tailored carbon accounting tool in line with international regulations

Impact

By 2024, 100 metal companies (mostly automotive suppliers) and 70 textile companies joined the programme. It provided key benefits, including improved carbon accounting accuracy and faster compliance with international regulations, which boosted the competitiveness of Turkish industry. Over 350 companies gained practical knowledge from training sessions and aim to spread it to more suppliers for increased impact, while participants are providing incentive schemes through capital expenditure (CapEx) and operating expenses (OpEx) projects.

Source: Consultation with MESS.

Opportunity 4: Contribute to improve and harmonize carbon accounting standards

Going further, public-private collaboration can enable and accelerate the harmonization of carbon accounting standards, which is key to improving the accuracy of carbon emissions calculation at the product level and reducing them effectively. Opportunities for collaboration include:

- **Improving calculation and reporting standards for corporate, sector- and product-level carbon accounting**. This can include setting adapted requirements for companies to calculate and disclose Scope 3 emissions, addressing barriers to effective reporting (e.g. providing relevant secondary data on energy and emissions), or supporting data verification and sharing along the supply chain, which can help close the digital divide between large companies and SMEs.
- **Enabling standards harmonization or interoperability** as a crucial lever for comparability, including aligning product carbon footprint (PCF) methodologies across sectors and countries (e.g. practical definitions and certifications to enhance data sharing, removing the economic, technical and regulatory barriers) and introducing clear guidance or regulatory mechanisms to encourage the appropriate use of "high-integrity" carbon credits (e.g. nature-based solutions and engineered removals).

Case study 4 highlights how the global logistics sector collaborated with the public sector to improve and harmonize carbon accounting standards in logistics. Case study 5 explores an innovative public-private sector approach to improving the transparency and trust in carbon offsets.

CASE STUDY 4

Global Logistics Emissions Council (GLEC) harmonizing standards and norms to decarbonize transportation and logistics

Challenge

Freight transport and logistics activities account for 8-10% of global greenhouse gas (GHG) emissions, with demand projected to nearly triple by 2050, according to the International Transport Forum.[14] Achieving the Paris Agreement targets will require significant improvements in freight transport efficiency and reductions in transport-related emissions. However, inconsistency in the methods of calculating GHG emissions across different modes of transport complicates the consolidation of multi-modal supply chain emissions, often resulting in inaccurate estimates.

Solution

Co-funded by industry coalitions and the European Commission, the Smart Freight Centre (SFC) co-established the Global Logistics Emissions Council (GLEC) in 2014 with members from corporations, industry associations and academia. The council has developed the GLEC Framework, a comprehensive methodology for standardizing the calculation and reporting of logistics-related GHG emissions across multi-modal supply chains. This framework covers all transport modes (road, rail, air and maritime) as well as logistics hubs and services such as warehousing. Designed to guide business decisions, the GLEC Framework helps to reduce emissions and track progress towards climate goals. It aligns with prominent institutions and standards such as the Greenhouse Gas Protocol, the UN-led Global Green Freight Action Plan and CDP Reporting.

Impact

The GLEC framework has been adopted by over 150 leading companies and is updated annually. It served as the primary industry guideline for developing ISO 14083, which was published in 2023. The introduction of ISO 14083 marks a significant milestone in gaining wider acceptance of the principles established by the GLEC Framework, which has been developed in collaboration with the industry over nearly a decade.

Source: Consultation with Kuehne Logistics University; Smart Freight Centre. (n.d.). *Calculate & Report: GLEC Framework.* https://www.smartfreightcentre.org/en/our-programs/global-logistics-emissions-council/calculate-report-glec-framework/; International Transport Forum. (2019). Transport demand set to triple, but sector faces potential disruptions.

CASE STUDY 5

ESTAINIUM Association enabling a comprehensive ecosystem for carbon footprint calculation and trustworthy carbon offset mechanisms

Challenge

Despite being a promising tool with high potential growth, carbon-offset markets and compensation mechanisms need substantial improvements in data quality and transparency, as tools remain today fragmented and disconnected.

Solution

ESTAINIUM Association initiated a consortium with the Government of the State of Querétaro, Mexico, industries and compensation partners to develop a technology stack enabling accurate carbon footprint calculation, recommendations for emissions reduction and avoidance, and transparency and reliability for carbon compensations through a trustworthy marketplace. Additionally, the platform delivers emissions monitoring and compensation certifications, enabling companies to receive a tax reduction incentive and ensuring transparency and compliance with local regulations.

Impact

The tool will enable Querétaro's industrial sector to offset 20% of its emissions using high-quality carbon credits, reducing up to 500 million tons of CO_2 annually. The project's potential extends beyond, as it delivers a scalable and replicable blueprint; seven nations and states in Latin America and Africa have already expressed their interest in rolling out this ecosystem.

Sources: Consultation with ESTAINIUM Association; Watson, A., M. R. Corzo, L. P. B. Pérez-Arce, R. J. T. Hernández, et al. (2024). Comprehensive Carbon Ecosystem: *A Seamless Solution for Corporate Compliance.* ESTAINIUM Association.

Opportunity 5: Proactively support net-zero solutions implementation across your value chain

As of 2024, SMEs are the backbone of communities and economies around the world, comprising 90% of business globally, employing 70% of the world's workforce and contributing to over 50% of global gross domestic product (GDP).[15] However, despite their collective impact, small businesses are often among the most vulnerable to change and disruption. Public-private collaboration can play a pivotal role in unlocking key barriers to value chains' decarbonization, both at the upstream and downstream stages. These collaboration mechanisms include:

- **Bridging knowledge, finance and technical gaps** through increasing adoption of net-zero decarbonization levers and technologies throughout value chains. Notably, this significantly enhances the provision of support to SMEs to access the resources and advice they need to understand and implement net-zero solutions.
- **Planning and developing the needed "green" skills** through appropriate training and qualifications schemes. For example, Intel collaborated with the Government of Malaysia to fund an AI-powered online education platform to build awareness of energy literacy.[16]
- **Raising consumer awareness for sustainable consumption** and improving information quality and launching appropriate campaigns
- **Removing regulatory barriers** (e.g. fast-track approval schemes) for greener products or infrastructure, creating data and regulatory support in free trade zones that allow for broader data transparency and shared infrastructure

Case study 6 illustrates how an industrial association has developed a dedicated training and knowledge-sharing programme to drive supply chain decarbonization. Case study 7 showcases how public and private stakeholders can partner to implement supply chain decarbonization at scale.

CASE STUDY 6

Nestlé and the Innovation Center for U.S. Dairy supporting dairy suppliers' net-zero journey

Challenge

The United Nations' Food and Agriculture Organization (FAO) estimates that the dairy sector globally contributes to roughly 4% of total GHG emissions.[17]

As a key player of the dairy value chain, Nestlé has already committed to achieving zero net GHG emissions by 2050. But it will likely need to be a collective effort, as a report found the vast majority of large meat and dairy companies "have yet to meaningfully address even the most basic sustainability risks."[18]

Solution

Nestlé supports the Net Zero Initiative, an industry-wide effort that will help US dairy farms of all sizes and geographies implement new technologies and adopt economically viable practices. The initiative is endorsed by dairy industry leaders and farmers to help eliminate the cost barriers and create incentives for farmers to achieve carbon neutrality, optimized water usage and improved water quality by 2050.

With the entire dairy community at the table – from farmers and cooperatives to processors, household brands and retailers – the consortium is harnessing the US dairy industry's innovation, diversity and scale to drive continued environmental progress. The Innovation Center for U.S. Dairy also announced a key milestone on its journey toward carbon neutrality: an investment of up to $10 million and a multi-year partnership with Nestlé to support the Net Zero Initiative and expand access to environmental practices and resources on farms across the country.

Impact

Nestlé was the first company to join the Net Zero Initiative, bringing funding and expertise to help propel its value chain progress toward a more sustainable future. The US dairy community hopes many partners will follow.

By using modern management practices and improving cow feed and genetics, the environmental impact of making a gallon of milk has dropped: from 2007 to 2017, it required 30% less water, 21% less land and a 19% smaller carbon footprint, according to the Innovation Center for U.S. Dairy.

Deploying these measures broadly across the dairy supply chain would enable the achievement of more significant sustainability improvements.

Sources: The United Nations' Food and Agriculture Organization (FAO); Nestlé. (2020). *Nestlé joins US dairy industry to reach net zero carbon emissions by 2050*; Devenyns, J. (2019). *Report: Meat and dairy companies have not addressed basic sustainability risks. Food Dive*; Byington, L. (2020). *Nestlé will support farmers to achieve net-zero carbon by 2050, supply chain chief says.* Supply Chain Dive.

CASE STUDY 7

Rockwell Automation and The Water Council driving SME water and energy innovation for a more sustainable supply chain

Challenge

Nearly 90% of the effects of climate change translate into water issues such as scarcity and flooding. Water and energy are intricately connected, and on the journey to decarbonization, SMEs, making up the backbone of supply chains, are often left behind to explore viable solutions.

Solution

The Water Council, in partnership with Rockwell Automation and additional companies, non-profits, universities and utilities, is leading the development of the Water + Energy Forward Engine (W+E Forward). This is part of a programme authorized by the CHIPS and Science Act in the United States, which invested over $200 billion, including funding to spur regional tech hubs and innovation clusters.

W+E Forward facilitates the development of water and energy technologies for small and medium-sized manufacturers and utilities, advancing innovations from research to development, commercialization and adoption. Initial efforts target food, beverage, paper and pulp manufacturing, focusing on waste-to-energy, water and energy efficiency, and smart systems for decarbonization while improving productivity. W+E Forward also addresses workforce development and innovative financing to support SMEs in adopting these technologies.

Impact

W+E Forward has grown to nearly 60 partners with an estimated $21 million in committed resources. In addition to funding, these partners contribute to facilities, research and expertise. In May 2023, the initiative received a $1 million Development Award from the National Science Foundation (NSF).

The technologies created help SMEs grow, reduce costs, increase water and energy efficiency, and accelerate the net-zero journey while meeting their supply chain requirements. The initiative has created stronger links between academia, small business, industry, non-profits and government and is transitioning from planning to implementation phase in 2025-2026, where it will begin to demonstrate its full impact.

Source: Consultation with Rockwell Automation.

Opportunity 6: Collaborate with governments to shape the policies for value chain decarbonization

As Scope 3 represents almost 70% of industrial GHG emissions, companies can take an active role in shaping industrial policies and accelerate the decarbonization of companies within their value chain.

Particularly, firms in developing economies and SMEs worldwide are significant players in global supply chain decarbonization but require a just and realistic transition to a low-carbon global value chain. According to the OECD, this involves:

- Fair distribution of environmental burdens and energy accessibility during the transition
- Sufficient community engagement and involvement in the transition
- Compensation for economic losses and remediation of environmental damage after the transition

This calls for a strengthened collaboration, both in developed and emerging economies, to increase and amplify climate action throughout value chains. Companies can take an active role in shaping the industrial policies and standards that accelerate value chain decarbonization.

Case study 8 shows how a footwear company, PUMA, collaborated with the Government of Bangladesh to support its suppliers' decarbonization efforts and reduce its Scope 3 emissions.

CASE STUDY 8

PUMA, International Finance Corporation and Government of Bangladesh decarbonizing tier 1 and tier 2 suppliers

Challenge

At the 2015 UN Climate Conference, PUMA committed to setting science-based CO_2 reduction targets. In 2018, PUMA co-founded the Fashion Industry Charter for Climate Action, an industry coalition aiming to align the fashion industry's emissions with the Paris Agreement's goals. By 2023, the company surpassed its goals seven years ahead of the target year (2030) through an 85% reduction of its own emissions – market-based, including the purchase of reduced emissions certificates (RECs) – and a 65% reduction of supply chain emissions.

Recognizing the growing demand for sustainability within the consumer industry, PUMA set more ambitious goals in 2022: a 90% reduction in its own operations and a 33% reduction in Scope 3 emissions by 2030 from a 2017 baseline.

Solution

In 2019, PUMA partnered with the International Finance Corporation (IFC), part of the World Bank Group, to launch a supplier financing programme under IFC's Global Trade Supplier Finance (GTSF). It provides short-term working capital to suppliers with tiered pricing based on their sustainability ratings. The first phase, under the Partnership for Cleaner Textile (PaCT) initiative, focused on energy and water efficiency, and renewable energy in Bangladesh. In 2024, PUMA launched the Decarbonization Programme (CaDP) in Cambodia, targeting four tier 1 and tier 2 factories.

PUMA also participated in a 2023 policy dialogue with the Government of Bangladesh, alongside key stakeholders in the fashion sector, to discuss how to jointly implement necessary changes, identify near-term actions to accelerate renewable energy use, support the scaling of renewable energy solutions and connect existing field efforts with best practices. The Government of Bangladesh has committed to accelerating the renewable energy transition, exploring direct power purchase agreements (PPAs) as a solution, going along with further fiscal and tax incentives and tariff upgrades seen as key policy interventions to drive progress.

Impact

Through the PaCT programme in Bangladesh and other initiatives led by tier 1 and tier 2 suppliers, PUMA reduced its absolute Scope 3 emissions from purchased goods and services by 30% between 2017 and 2023.

Source: PUMA. (n.d.). *Sustainability: Climate*. https://annual-report.puma.com/2023/en/sustainability/climate/index.html.

Opportunity 7: Co-invest in climate technologies development, infrastructure and market creation

Industrial companies, especially multinationals, can take an active role in shifting and scaling investments into viable low-carbon technologies (e.g. green hydrogen, renewable energy, carbon capture and removal, infrastructure, new business models, and market creation) to enable their net-zero pathway. Moreover, according to Capgemini and Breakthrough Energy's 2020 report, *Fit for Net Zero*, scaling investment in climate technologies can achieve dramatic emissions reduction (e.g. 55% CO_2 reduction by 2030 in Europe) while creating attractive returns on investment. Every €1 invested in this clean technology portfolio is expected to generate €9 of future turnover in European markets by 2050.[19] Conversely, the public sector can not only co-invest, but also simplify and reduce permitting delays to enable faster shared infrastructure development. One example is Germany's Hydrogen Acceleration Act, which is anticipated to be implemented by the end of 2024.

Industrial clusters, such as the one in Dunkirk (see case study 9), are successful examples of co-located companies collaborating with public actors to co-invest in climate technologies' development and showcase significant impact.

CASE STUDY 9

ArcelorMittal and the French government leading an industrial cluster in Dunkirk for the scaling up of climate technologies

Challenge

Dunkirk's industrial cluster emits 16 megatonnes (Mt) of CO_2 annually, contributing to 20% of France's industrial emissions. The challenge was to significantly reduce emissions in line with national and international climate targets (55% GHG emissions reduction by 2030 and net zero by 2050), while maintaining economic growth and operational efficiency.[20]

Solution

Through the France 2030 investment plan, the French government allocated €5.6 billion to support the transition to a green economy via new business models such as Zone Industrielle Bas Carbone (ZIBAC). Dunkirk's ZIBAC is a consortium operated by Euraénergie, which oversees and steers all the projects to drive unified territorial sustainability development efforts like the "DKarbonation" project. Key private partners from various sectors, such as energy, logistics and chemicals, have joined forces with key public actors – such as centralized clearance for import (CCI) territory, the urban community and the maritime port – to operate within the industrial cluster of Dunkirk. As one of the key partners, ArcelorMittal has planned to install electric furnaces and blast furnaces with direct reduced iron (DRI) technology and implement CO_2 capture technologies, aiming to capture 4,400 tons of CO_2 annually. The French state directly contributed to support ArcelorMittal with a €850 million subsidy for decarbonization and helped to structure ZIBAC with €17 million, including €4 million for feasibility studies on innovative projects like low-carbon hydrogen production and a "heat highway".

Impact

With over 460 companies involved, Dunkirk is set to become a leading European hub for the green industry, reducing its carbon footprint and aligning with France's net-zero goals by 2050. This public-private collaboration is expected to enhance the attractiveness of the industrial cluster, stimulating economic growth while ensuring a sustainable industrial ecosystem. The collaboration between public and private entities exemplifies a robust model for achieving regional decarbonization objectives.

Source: Dunkerque Énergie Créative.

CASE STUDY 10

India's public-private collaboration scaling production and infrastructure for green hydrogen

Challenge

In 2019, the combined emissions of India's energy and industrial sectors represented more than 80% of the country's total emissions.[21] As such, there is a pressing need to decarbonize by exploring climate technologies. Green hydrogen has been identified as a potential game-changer with sectoral applications in transport (e.g. aviation, maritime, railways) and industry (e.g. steel, chemicals, refineries, etc.), with the challenge of scaling India's production capacity and making it cost-competitive.

Solution

The Ministry of New and Renewable Energy (MNRE) launched the National Green Hydrogen Mission to spearhead India's decarbonization efforts through a public-private collaboration model. This involved green hydrogen producers and electrolyser manufacturers such as ACME Cleantech, Greenko ZeroC, Reliance Green, Welspun, Torrent and L&T Electrolyser through a tendering process. The project is expected to enable a green hydrogen production of at least 5 million tonnes per annum by 2030.[22]

The project embeds key policy instruments like the Strategic Interventions for Green Hydrogen Transition (SIGHT), providing incentives, tax exemptions and job creation necessary to accelerate the development of green hydrogen.

Impact

India's National Green Hydrogen Mission is expected to generate investments of more than $95 billion, generate 600,000 jobs and mitigate nearly 50 million tonnes of GHG emissions annually by 2030. Since its launch, major industrial and transport partners have benefited from the incentives and supported the development of hydrogen hubs with shared infrastructure, while countries like Japan and Singapore have contributed to financing hydrogen value chain building in India.

Source: Consultation with Invest India; United Nations Framework Convention on Climate Change (UNFCCC). (2023). *India. National Communication (NC). NC 3*; Government of India, Ministry of New and Renewable Energy. (n.d.). *National Green Hydrogen Mission*.

Opportunity 8: Help create the policy conditions for climate technology adoption

Policy-makers and industrial stakeholders have a critical role in facilitating innovation and co-creating the policy and regulatory frameworks that incentivize and support the development, commercialization, diffusion and demand for climate technologies. Companies and governments may not only fund R&D, the high-risk aspect of technology development, but they may also invest in the commercialization stage of climate technologies.

Collaboration between the public and private sectors can improve the needed policy instruments to support each stage of climate technology development and adoption, such as:

- Establish or improve climate technology innovation policy frameworks.
- Improve policy and regulatory frameworks that incentivize climate technology adoption, reduce investment risk and provide price support where necessary.
- Create institutions supporting the integration of climate technology considerations in development and economic planning.
- Boost demand and increase market readiness for climate technologies thanks to public procurement policies.

The Industrial Deep Decarbonization Initiative (IDDI), coordinated by the United Nations Industrial Development Organization (UNIDO) and involving several governments and industrial companies worldwide, exemplifies how such public-private collaboration can work to scale green materials adoption (see case study 11).

CASE STUDY 11

UNIDO's initiative boosting sustainable steel and cement demand creation

Challenge

The steel and cement industries, each accounting for 7-8% of global emissions, remain challenging to decarbonize. Stimulating the necessary demand for their adoption requires new value chains and competitive markets for clearly defined net-zero construction products.

Government agencies are top purchasers of steel and cement for major projects such as buildings, roads and bridges, making their procurement policies a powerful tool in creating markets for low emission materials.

Solution

Coordinated by UNIDO and co-led by UK and India, Clean Energy Ministerial's (CEM) IDDI is a coalition of government initiatives and organizations designed to create lead markets for low-emission industrial materials. The coalition is composed of several working groups embedding the public and private sector, to focus on establishing data and reporting frameworks, harmonizing low-emission standards and definitions, and advocating for public procurement commitments.

As part of the commitments under the IDDI's Green Public Procurement (GPP) pledge, the governments of Canada, Germany, US and UK held preliminary consultations for their policy-making processes, including requests for information, focus groups, consultations with experts and technical workshops to address policy actions' development and implementation. In the working groups, stakeholders who are developing policies gather feedback from the affected private actors, so that new policies can be better understood and improved.

Impact

The consultation processes influenced new policies and programmes, as well as updates of existing procurement criteria that promote near-zero steel and cement, and advance market readiness through increased procurement.

Involving the private sector in the policy-making process increased viability, timely implementation, commitment and compliance, while ensuring an effective allocation of resources and sharing of firsthand operational knowledge to the public sector. The signatories' annual progress reports[23] and an upcoming report quantifying the impact of these commitments on CO_2 emissions showcase these successes.

Source: Consultation with the IDDI; United Nations Industrial Development Organization (UNIDO). (n.d.). *Industrial Deep Decarbonization Initiative: An Initiative of the Clean Energy Ministerial.* https://www.unido.org/IDDI.

Way forward to net zero requires a cultural shift

Breaking the barriers to buy-in, business case, carbon calculation and mitigation across value chains, and green business growth is critical for companies seeking to reach their net-zero objectives. As more efforts are required to reach net zero, public-private collaboration is pivotal in overcoming key barriers and providing the conditions and signals for businesses to advance their climate actions.

To address these challenges, the Industry Net Zero Accelerator initiative, through consultations with its community, identified eight public-private collaboration opportunities supported by real-world case studies from early movers, providing actionable insights to make the most of existing collaboration mechanisms and engage in net-zero policies design:

- **Opportunity 1:** Understand and leverage public financial mechanisms for net zero
- **Opportunity 2:** Engage your sector to co-develop financial mechanisms for net zero
- **Opportunity 3:** Facilitate carbon tracking adoption within your value chain
- **Opportunity 4:** Contribute to improve and harmonize carbon accounting standards
- **Opportunity 5:** Proactively support net-zero solutions implementation across your value chain
- **Opportunity 6:** Collaborate with governments to shape the policies for value chain decarbonization
- **Opportunity 7:** Co-invest in climate technologies development, infrastructure and market creation
- **Opportunity 8:** Help create the policy conditions for climate technologies adoption

These opportunities provide a path for companies to take action and proactively engage and collaborate with public stakeholders to accelerate decarbonization. This will require a cultural shift, where private and public stakeholders work together more systematically to create the conditions for industrial decarbonization. This mindset can enable increased resilience and mutual benefits as both sectors seek to achieve their net-zero targets while driving economic growth and improving quality of life for people and society.

Given the complexity of decarbonization challenges, this white paper aims to assist businesses and governments in enhancing their industrial decarbonization strategies. Ideally, this white paper will encourage more organizations to embrace these opportunities by engaging with public bodies, joining a multistakeholder community and contributing to the collaborative effort of exchanging knowledge and best practices.

The World Economic Forum's Industry Net Zero Accelerator initiative is committed to supporting leaders across industry sectors, governments, academia and civil society by closing the awareness and knowledge gaps necessary to accelerate the net-zero journey. Moving forward, the initiative community will continue to inform decision-making, celebrating industry leaders' achievements, highlighting change stories and promoting learning (notably through its digital repository of decarbonization case studies[24]) and supporting SMEs in this transition.[25]

The urgency and opportunities to make a difference have never been greater – organizations must act now, proactively co-shaping and learning as they progress towards net zero.

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