



Actors' Engagement

Mutual Learning Exercise on Industrial Decarbonisation

Third thematic report

PSF CHALLENGE

**HORIZON EUROPE
POLICY SUPPORT FACILITY**

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Report**



*Research and
Innovation*

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1. Introduction

This Mutual Learning Exercise (MLE) serves as a platform for 12 participating countries to discuss their specific needs and interests, exchange experiences and knowledge about success factors and lessons learnt and provide guidance to policy makers on how to develop or update their industrial technology roadmaps, and sector-specific strategies for industrial decarbonisation¹.

This Thematic Report has been prepared as a result of the third meeting of this MLE, held virtually on 19 September 2023.

1.1. Objectives

The MLE on Industrial Decarbonisation² is expected to contribute to achieving the Green Deal objectives and to follow up on one of the actions of the first European Research Area (ERA) industrial technology roadmap, namely, to facilitate specific national sectoral and cross-sectoral strategies or programmes with key stakeholders as part of the ERA policy agenda 2022-2024.

In addition, the MLE provides insights into best practices and models for mobilising private and public investments in low-carbon technologies in Energy Intensive Industries (EII) and their deployment, taking into account also framework conditions, with the objective of supporting the green transition and achieving net-zero emissions.

The MLE is structured in rounds of meetings on four specific topics and a final meeting concluding the exercise, proposed by the European Commission in the ERA Forum in October 2022 and refined after a consultation process with the participating countries during a scoping online workshop on 12 December 2022. The four topics of the MLE on industrial decarbonisation are:

- Topic 1: Introduction and overview of national strategies.
- Topic 2: Policies, design, and financing for R&I investments in development, uptake, and deployment of low-carbon technologies.
- Topic 3: Actors' engagement.
- Topic 4: Framework conditions.

The kick-off meeting (online, Topic 1) was held on 28 April 2023. The second meeting was held in Vienna (Austria) on 29-30 June 2023 focusing on topic 2. The third meeting was held remotely on 19 September 2023 (topic 3). The fourth meeting will take place on 28-29 November 2023 in Lisbon (topic 4). On 29 January 2024, the draft final report will be

¹ 'European Semester and Country Intelligence' of the ERA & Innovation Directorate at DG Research and Innovation is the Policy Support Facility Team for this MLE, while 'Industrial Research, Innovation and Investment Agendas' oversees the work, with the support of 'Industrial Transformation' of the Prosperity Directorate, DG Research and Innovation. Doris Schröcker (Head of Unit) and Evgeni Evgeniev (Policy Officer), 'Industrial Research, Innovation and Investment Agendas', as well as Garbiñe Etxebarria Guiu (Senior Expert), 'Industrial Transformation', have provided substantial comments to earlier drafts of the report.

² [Factsheet of the Industrial Decarbonisation MLE](#)

discussed (online). A final dissemination event is envisaged to take place on 27-28 March 2024 in Belgium.

1.2. Structure of the report

In the third thematic report on "Actors' Engagement", the diverse roles of various stakeholders in industrial decarbonisation, including enterprises, governments, and community groups are explored. The report is structured to provide a comprehensive understanding and it draws from the insights of the third MLE meeting, held virtually on 19 September 2023, where diverse perspectives converged to discuss the role of actors' engagement in industrial decarbonisation initiatives.

The report is structured as follows. Initially, it outlines the key areas of industrial decarbonisation influenced by effective stakeholder engagement, emphasising the synergy between different industrial sectors. Following this, the roles of various stakeholders are presented, highlighting the significance of their involvement as a catalyst for decarbonisation and the challenges and opportunities this presents. Subsequent sections analyse the necessity of effective communication and the critical role of education and skill-building for successful decarbonisation. This is enriched by insights from Research and Technology Organisation (RTO) and industry representatives offering practical viewpoints and comparative analyses of strategies while showcasing exemplary practices in industrial decarbonisation across various sectors and regions. The concluding sections of the report synthesise these themes, presenting a comprehensive overview of the current landscape and the ways forward to achieve impact.

2. Main areas of industrial decarbonisation impacted by efficient actors' engagement

Climate change poses a complex challenge, with critical uncertainties to navigate. To tackle this pressing issue and advance the cause of industrial decarbonisation as a pivotal solution in mitigating and stopping climate change, governments must collaborate closely with a wide range of stakeholders, including industries, research organizations, Non-governmental organizations (NGOs), and community groups. This collaborative effort necessitates substantial societal and economic transformations, underpinned by the imperative to plan and invest with a forward-looking, long-term perspective. Moreover, education and training will also play vital roles in driving these essential changes."



Figure 1: Photograph capturing a corporate professional, extending his arm to activate a CO2 reduction tile.

Traditional means to reduce carbon emissions from industries may not be sufficient to prevent severe global warming effects (Tàbara et al. 2019). As such, experts are calling for new ways to work with stakeholders and share knowledge to bring about significant change. These new methods focus more on finding solutions rather than just discussing problems, however, finding the right solutions remains difficult. Chomsky (2022) notes that solutions aren't just about technology, but also fairness and clear communication.

To effectively address climate change, we need to understand the politics, society, and economics that guide how industries operate and how people react to these changes (Chomsky, 2022). Three key areas of action include:

1. **Rethinking finance:** This means increasing funding for climate projects, creating new financial tools, partnering with both public and private sectors, and managing risks tied to outdated assets.
2. **Adapting to changing demand and costs:** This refers to an overall awareness of climate risks and opportunities, as well as the need to reduce technology costs with research, collaborate across industries to manage increased costs, and set up incentives to help with the transition.
3. **Supporting affected communities:** This involves creating new economic opportunities, training programmes for workers, and providing social support.



Figure 2: The main actors of industry decarbonisation

Involving various stakeholders enables reaching out to a wide and interdisciplinary source of knowledge, vital for tackling complex problems. This involvement not only brings diverse expertise on board, but also boosts trust and acceptance of solutions among the broader community (Schoonover et al., 2019).

By actively involving local stakeholders, their practical expertise and unique perspectives can be revealed. This approach often leads to the development of innovative solutions for addressing enduring societal issues. Importantly, when individuals are active contributors to shaping these solutions, they are more inclined to endorse and support them, as supported by research (Hirsch Hadorn et al., 2008; Jäger et al., 2008; Drews and van den Bergh, 2016)

During this engagement, a valuable exchange often occurs where both the scientific community and the general public learn from each other. This mutual learning can help overcome longstanding differences and promote better collaboration (Pahl-Wostl, 2002; Jahn et al., 2012).

In cases where simulations are used to understand potential outcomes, stakeholder input can offer a clearer picture of how different groups might behave (Tabara et al., 2007). As experience from different projects and initiatives shows (look at Box 1), these involved stakeholders are typically more motivated to spread the word and aid in implementing solutions, especially if it aligns with their interests.

The transition towards industrial decarbonisation requires significant changes and adaptations. One of the main approaches to facilitating these transformations is to view them within the broader lens of a supply chain perspective. This perspective emphasises the importance of collective actions. Two points are important to consider in this. First, the supply chain perspective provides a holistic insight into the intricate flow of materials, goods, and information across different production stages. However, it is vital to acknowledge that this perspective, on its own, may not suffice. Second, alongside the supply chain perspective,

there is a persuasive need to emphasize the significance of cross-sectoral collaboration. This collaboration extends beyond manufacturing sectors and encompasses vital partnerships with the energy sector. Particularly prominent at the regional level, these collaborations unlock various opportunities, such as shared resources and heat exchange, enhancing the overall efficiency and sustainability of the decarbonisation process.

The first element centres on the all-encompassing nature of this transition. For each supply chain, every type of stakeholder, irrespective of their geographical location or sector, plays a part in the global production and consumption networks. This interconnected role implies that each actor, directly or indirectly, plays a role in emissions production.

The second reason element underscores the uneven distribution of challenges and costs associated with this transition, extending beyond supply chains to involve cross-sectoral collaboration. It is evident that not all stakeholders bear the burden equally. Some, owing to their substantial emissions contributions, are more profoundly affected than others. To effectively address these imbalances, it becomes crucial to ensure equitable treatment. Without sincere and strategic efforts in this direction, those most affected may be reluctant to commit to decarbonisation targets. However, with the right orchestration, collective action can motivate the actors most implicated by emissions to actively participate, transcending supply chains and fostering cross-sectoral collaboration.

Here are the specific areas of industrial decarbonisation where actor engagement can have the greatest impact:

- **Policy and regulation.** For instance, governments can impose stricter emissions standards, thereby nudging industries towards low-carbon technologies. Moreover, the introduction of carbon pricing tools such as carbon taxes or cap-and-trade systems can add a financial incentive for industries for greener alternatives.
- **Technology development and deployment.** Efficiently engaging actors can stimulate increased investments in Research and Development (R&D), pioneering new emission-reducing technologies. Furthermore, industries that are actively involved can expedite the scaling-up and commercialisation of these innovative technologies, broadening their reach.
- **Infrastructure and systems integration** encompasses industries, governments, research institutions, and technology providers. Industries play a central role by transitioning to renewable energy sources and implementing Carbon Capture and Storage (CCS) technologies, significantly reducing their carbon footprints. Governments facilitate this transition through policy incentives and regulatory frameworks, while research institutions and technology providers drive innovation in renewable energy integration and CCS, enabling industries to achieve substantial emissions reductions. Together, these actors catalyse a transformative shift in industrial practices, aligning them with sustainability goals and global efforts to combat climate change.
- **Supply chain transformation** involves industries shifting towards sustainable raw materials and championing the principles of a circular economy. In addition, collaborating with transportation providers can pave the way for a shift to cleaner transportation modes, such as electric or hydrogen-powered transport, further curtailing emissions.
- In enhancing **operational efficiency**, technology and best practices can be applied to optimise processes, which can dramatically decrease waste and emissions. Enhancing **operational efficiency** involves industries, businesses, technology providers, and consultants. They employ technology and best practices to optimize processes, reducing waste and emissions. This not only leads to cost savings and improved resource sustainability but also directly lowers emissions. Companies that are

operationally efficient gain a competitive advantage, comply with regulations and contribute to environmental goals. In summary, these collaborative efforts drive economic and environmental benefits, making operational efficiency a crucial aspect of industrial decarbonisation practices.

- **Financing and investment** are pivotal, with financial institutions introducing green bonds and loans with favourable terms for decarbonisation projects. Simultaneously, shareholders and investors can play their part, pressuring industries to adopt decarbonisation practices and be transparent about their carbon contributions.
- **Collaboration and knowledge sharing** are essential for pooling resources and insights. Industries can collaborate on joint R&D projects, share infrastructure, or even engage in public-private partnerships to drive large-scale decarbonisation initiatives.
- **Awareness and education** can significantly shift industry paradigms. Commitment to employee training can foster the development of bottom-up initiatives for decarbonisation. Concurrently, consumer engagement related to product environmental impacts can boost demand for more sustainable alternatives.
- **Transition strategies** ensure that the move to a low-carbon industry is both fair and devoid of economic disparities. It is essential to engage with communities and workers, while focusing on just transition principles. Industries that rely heavily on carbon intensive processes can also diversify their business models, ensuring their continued relevance in a decarbonised world.
- **Monitoring and verification** require industries to engage in transparent reporting of emissions, fostering trust with stakeholders and pinpointing areas ripe for improvement. Third-party verification ensures that the emissions data reported stands up to scrutiny, bolstering its credibility.

Considering industrial decarbonisation from a supply chain perspective provides a comprehensive outlook and underscores the importance of cross-sectoral collaboration, offering a well-rounded approach. The unity principle, underpinned by the equitable treatment of all stakeholders, emerges as a keystone for meaningful and effective action. As challenges and imbalances are addressed collaboratively, the industry can move towards more sustainable practices for industrial decarbonisation, augmenting global efforts to combat climate change.

3. Actors' involvement as a key catalyst for effective industrial decarbonisation

The increasing threat of climate change has accelerated the importance of industrial decarbonisation. While technological progress offers a promising perspective, the ultimate realisation of comprehensive industrial decarbonisation largely depends on the active participation of various stakeholders.

Stakeholders, spanning from industries and governments to civil society and consumers, play pivotal roles, each uniquely influencing the trajectory of decarbonisation. Their concerted efforts, insights, and resources amplify the chances of success in achieving meaningful and lasting carbon emissions reductions.

Industries, often at the forefront of carbon emissions, now shoulder a significant part of the responsibility. With a renewed focus on carbon neutrality, industries are undertaking technological innovations and operational shifts. Their decisions, particularly in supply chain management, echo throughout the entire industrial ecosystem. Engaging with supply chain

partners, such as Original Equipment Manufacturers (OEMs), can either propel or hinder an industry's decarbonisation agenda.

Governments have a powerful tool for shaping industry behaviour: policy. By implementing legislative frameworks tailored to limiting carbon emissions and specific industry needs, they can incentivise or mandate change. The European Green Deal, for instance, illustrates a collaborative governmental effort, guiding nations while recognising the unique challenges each faces. Through policies, governments also have the power to orchestrate further stakeholder engagement, ensuring a comprehensive approach.

Financial institutions are also active in the transition. Their strategies, particularly related to green finance, are driving industries towards sustainability. By addressing the risks associated with climate change and redesigning financial products, they direct capital to more sustainable businesses.

Research and academic institutions enrich the decarbonisation discourse with knowledge creation, innovation, training, and awareness raising. Their active involvement ensures that solutions are not just addressing short-term challenges, but also anticipate future challenges. Additionally, by fostering a well-informed future workforce, they anchor the decarbonisation agenda firmly among future industry leaders.

Civil society and NGOs offer a vital checks-and-balances mechanism. By advocating for environmental priorities, challenging greenwashing, and partnering directly with industries, they ensure that the drive towards sustainability remains genuine and grounded.

Lastly, consumers, equipped with more information than ever, are a powerful force driving industrial change. Their increasing demand for transparency as well as sustainable products directly influences industrial strategies, making their engagement crucial for industries aiming to thrive in a decarbonised future.

While the advantages of multi-stakeholder involvement are evident, challenges remain (see

Box 1). Aligning diverse interests, while navigating economic concerns, and ensuring compliance across varied regulatory landscapes, can be daunting. These challenges underscore the need for continued, deepened stakeholder engagement.

As such, the path to effective industrial decarbonisation is a complex one, with many actors necessarily actively involved. Their collective participation, influence, and accountability ensure a strong, resilient, and accelerated transition towards a decarbonised industrial future.

Impact of actors' involvement for Ireland's industrial decarbonisation

In the context of Ireland's industrial decarbonisation, a multitude of stakeholders collectively play an instrumental role in advancing the nation's ambitious climate goals, as delineated in "Ireland's National Climate Action Plan". These stakeholders are integral to the comprehensive and diligent strategy aimed at reducing greenhouse gas emissions by 50% by 2030 and achieving net-zero emissions no later than 2050. This collective commitment positions Ireland as a global example in the realm of decarbonisation endeavours.

- 1. Government and regulatory authorities:** The Government of Ireland, through its climate action plan, sets the regulatory framework and targets for emissions reduction. These policies and regulations set the foundation for industrial decarbonisation initiatives.

2. **Businesses and corporations:** The prominent role of businesses is pivotal in the context of industrial decarbonisation. Businesses are called upon to embrace transformative actions, including capital investments, workforce upskilling in green technologies, and substantial investments in R&D to face the multifaceted challenges inherent to decarbonisation.
3. **IDA Ireland:** The governmental agency entrusted with foreign direct investment in Ireland, IDA Ireland, assumes a central role. By collaborating with over 1,700 multinational clients employing nearly 300,000 individuals, IDA Ireland actively supports corporate entities in their pursuit of decarbonising their operations, aligning with Ireland's climate objectives.
4. **Industry associations:** Industry associations and trade groups are essential in fostering collaboration and knowledge exchange within specific sectors to drive down emissions collectively. They play a vital role in developing sector-specific decarbonisation strategies.
5. **Investors and financial institutions:** Investors and financial institutions contribute to decarbonisation by directing capital towards businesses with robust sustainability strategies. This allocation of resources fosters decarbonisation efforts and underscores the financial sector's role in the transition to a low-carbon economy.
6. **Collaborative partnerships:** Collaborative partnerships between IDA Ireland and organisations like the Sustainable Energy Authority of Ireland (SEAI), the Environmental Protection Agency, Enterprise Ireland, and various governmental departments are pivotal. These alliances facilitate the exchange of valuable insights, investments in talent, and the implementation of best practices, collectively advancing decarbonisation objectives.
7. **Expert knowledge:** Leveraging the wealth of expert knowledge within Ireland and the broader European Union (EU) fosters a cooperative national effort toward a net-zero future. Knowledge exchange, research collaboration, and shared insights among experts enable Ireland to align with global decarbonisation imperatives.

In summary, stakeholders from various sectors, including government, industry, finance, and civil society, are in close collaboration in Ireland's journey toward industrial decarbonisation. Their collective efforts underscore Ireland's commitment to climate action, positioning the nation as one of the leaders on the global stage of sustainable and decarbonised industry practices.

Box 1: Impact of actors' involvement for Ireland's industrial decarbonisation

4. Continuous and effective communication for facilitating industrial decarbonisation

Building upon the engagement of various stakeholders discussed earlier, the trajectory of industrial decarbonisation is highly dependent on continuous and effective communication. It is a cornerstone, acting as both a catalyst and a binder, that brings together and harmonizes the views of these diverse actors toward a common objective: carbon neutrality.

Challenges and opportunities: Communication in the realm of decarbonisation faces the inherent challenge of resonating with a diverse audience, each with varied knowledge levels and priorities. It is not just about broadcasting information, but also about ensuring its absorption, relevance, and effectiveness. The opportunity lies in creating a narrative that unites and mobilises, transforming the vast landscape of stakeholders from passive recipients to active participants.

Strategies for engagement: Dissemination of results and continuous support for decarbonisation initiatives is achieved effectively through regular updates that do not just present facts, but also celebrate milestones, however minor. Platforms that allow stakeholders to share their success stories, discuss challenges and find collaborative solutions, foster a culture of shared responsibility. Moreover, multimedia tools, such as infographics and interactive content, can make the communication process more engaging, ensuring that messages reach the target audience while retaining their attention.

Supply chain perspective: Communication tailored to the supply chain emphasises the interdependence of its various links. Each entity, from suppliers to distributors, plays a unique role in the decarbonisation process. Effective communication can elucidate this interconnectedness, stressing that the decarbonisation efforts of one link can be amplified or diminished by the actions of another. Equitable treatment in this dialogue ensures that every stakeholder, irrespective of their position in the chain, feels valued and integral.

Role of various channels: In an era marked by information overload, leveraging the right communication channels is paramount. Social media platforms, due to their vast reach, are powerful tools to foster awareness and drive action, especially among younger demographics. Workshops, seminars, and webinars can cater to industry representatives and supply chain partners, providing them with a deeper dive into the nuances of decarbonisation. At the same time, marketing materials can subtly integrate the importance of sustainability, targeting consumers and nudging their choices towards eco-friendly alternatives.

In the larger scheme of things, **communication** plays multiple roles: it nurtures, motivates, and facilitates collaboration. Regular reporting promotes transparency and creates an atmosphere of trust. Clarity in messaging, without overwhelming technical jargon, ensures that the essence of the communication is not lost. In addition, acknowledging concerns, potential barriers, and uncertainties and actively discussing strategies to mitigate them increases resilience to challenges. For example, Sweden's experience highlights the role of communication in achieving industrial decarbonisation goals: the country's ambitious commitment to zero fossil fuels is reflected in the active engagement of its companies, and effective communication connects these efforts with stakeholders (see Box 2).

Involvement of actors in achieving industrial decarbonisation goals: The Swedish experience

Sweden has set an ambitious goal to become one of the world's first fossil fuel-free welfare states, and numerous Swedish companies are actively engaged in voluntary efforts to reduce their climate impact - a critical component of industrial decarbonisation. The driving forces behind these ambitions are manifold, encompassing aspects of risk management, corporate responsibility, reputation management, and responsiveness to the evolving demands of various stakeholders, many of whom are increasingly concerned about sustainability. From an industrial decarbonisation perspective, the following actions are highly significant:

1. **Risk management for industry:** Companies are increasingly aware of the risks associated with climate change, including regulatory changes, physical risks, and market shifts. By proactively reducing their carbon emissions, Swedish companies are better positioned to adapt to evolving regulations and market preferences, thus safeguarding their long-term viability.
2. **Corporate responsibility and sustainability:** Industrial decarbonisation aligns with the broader global trend of corporate sustainability. Businesses recognise their role in mitigating climate change and understand that their stakeholders,

including customers, investors, and employees, expect them to take concrete steps toward reducing their carbon footprint.

3. **Reputation management:** Consumers and investors are becoming more climate-conscious, and a company's reputation is increasingly linked to its environmental stewardship. By actively working to reduce their climate impact, Swedish companies not only protect their brand but also enhance their market position.
4. **Stakeholder demands:** Various stakeholders, including customers, investors, and advocacy groups, are vocal about their expectations regarding sustainability. Companies that address these demands are better positioned to maintain positive relationships with these stakeholders and avoid potential backlash or divestment.
5. **Decarbonisation benefits:** Sweden's favourable conditions for climate action, such as access to abundant renewable energy sources, offer a pragmatic foundation for industrial decarbonisation efforts. This facilitates the transition to cleaner and more sustainable operations, reducing the carbon intensity of various industries.
6. **Cross-border influence:** Given the international operations of many Swedish companies, their commitment to industrial decarbonisation extends beyond national borders. By implementing sustainable practices and technologies in their global operations, these companies contribute to broader global efforts to combat climate change.

In summary, Sweden's ambitious climate goals and the active engagement of its companies in industrial decarbonisation initiatives underscore the critical role of the private sector in addressing climate change. These efforts not only align with Sweden's national objectives but also position Swedish companies as leaders in sustainable business practices, with a potentially global influence on industrial decarbonisation trends.

Box 2. Involvement of actors in achieving industrial decarbonisation goals: The Swedish experience

As industries around the world embark on the industrial decarbonisation path, their success will be greatly influenced by how effectively they communicate. A consistent, transparent, and collaborative approach to communication can mobilise stakeholders and create a united front against the multifaceted challenges of climate change.

5. Addressing knowledge and competence for successful industrial decarbonisation

Industrial decarbonisation is a complex and multi-faceted endeavour, and its successful implementation requires a nuanced understanding and application of knowledge across multiple domains. The transition to carbon neutrality is not only a technical change but requires broader social, economic, cultural, and organisational transformation. From the perspective of knowledge and competences related to the successful decarbonisation of industry, it can be stressed that the success of this transition largely depends on the recognition, development, and utilisation of competences at all levels.

Equitable counterbalancing mechanisms are essential to address the socioeconomic impacts of decarbonisation. As industries evolve, communities and workforces rooted in traditional industrial practices might face displacement. Knowledge on the complexity of this transition, from both a technical and social perspective, can guide the formulation of policies that compensate and retrain affected individuals. For instance, insights into emerging sustainable

sectors can direct workforce retraining programmes, ensuring that displaced workers acquire skills relevant for the jobs of the future. Furthermore, understanding the specific socio-cultural fabric of affected communities can inform policies that are not just economically compensatory but also culturally sensitive.

Stakeholder engagement broadens the spectrum of knowledge and expertise available to industries. Industrial decarbonisation is not just a challenge of technology but also of economics, sociology, and politics. By actively engaging with stakeholders – from local communities to global experts – industries can tap into a wealth of knowledge that is diverse and holistic. Local communities can provide insights into how specific initiatives might affect them, researchers can share the latest advancements in clean technologies, and policymakers can shed light onto regulatory landscapes. Such a broad base of knowledge allows industries to address the multi-dimensional challenges of decarbonisation more effectively.

The synergy between science and society strengthens the effectiveness of decarbonisation efforts. Science offers technical solutions, while society provides a context to their applicability. When stakeholders are actively involved, there is a mutual learning process. Scientists get a clearer understanding of on-the-ground realities, challenges, and the overall acceptability of their solutions, while society gains a deeper appreciation of the scientific rationale behind decarbonisation. This mutual enlightenment accelerates the development and adoption of solutions that are both technically sound and socially embraced.

The transition to carbon neutrality also depends on learning between organisations. Knowledge should not be hidden in a single entity but should permeate the entire supply chain. The industry's decarbonisation efforts may be boosted or muted depending on how its suppliers, partners, and distributors adapt to these changes. Therefore, the continuous exchange of knowledge and development of competences in the supply chain is very important.

Governments and educational institutions play vital roles in the knowledge ecosystem for successful industrial decarbonisation. They strengthen environmental education, equipping future workers with the understanding and skills needed for decarbonisation. Additionally, they foster a culture of environmental awareness through public awareness campaigns and regulations. Governments facilitate workforce development by aligning education with industry needs, ensuring a skilled workforce for implementing decarbonisation strategies. This collaborative effort lays the foundation for informed, skilled, and environmentally conscious individuals, supporting the transition to a low-carbon economy.

Cooperation in training and education is extremely important for equipping individuals with the skills necessary for successful industrial decarbonisation. This transition requires a deep understanding of various domains, extending beyond technical aspects to encompass social, economic, cultural, and organizational dimensions. Recognizing the need for future competencies, stakeholders must collaborate to identify evolving trends in research and anticipate future needs. Shared learning infrastructures and knowledge-sharing mechanisms can ensure that individuals have access to relevant education and training. As industries evolve, equitable counterbalancing mechanisms should address the potential socioeconomic impacts of decarbonisation. This includes policies to compensate and retrain affected individuals, guided by insights into emerging sustainable sectors and a profound understanding of the socio-cultural fabric of impacted communities. Stakeholder engagement (from local communities to global experts) enriches the pool of knowledge available to industries. In addition, promoting cooperation between science and society accelerates the development and adoption of technically sound and socially acceptable solutions. Knowledge exchange within the supply chain and collaboration with governments and educational institutions further strengthen the knowledge ecosystem, ensuring that a skilled and

environmentally conscious workforce is at the forefront of driving the transition toward a low-carbon economy. The Sunrise Valley Science and Technology Park in Lithuania serves as a prime example of successful collaboration in education for decarbonisation. It brings together clean technology companies, scientific and educational institutions, and key stakeholders to jointly share knowledge and resources (see Box 3).

Experience of the Sunrise Valley Science and Technology Park in Lithuania

The Sunrise Valley Science and Technology Park in Lithuania plays a crucial role in guiding industrial decarbonisation efforts. It brings together clean technology companies, scientific and educational institutions, and key stakeholders to share knowledge and resources. The best example of such efforts is the Case of collaboration with the Cleantech Cluster Lithuania there the joint efforts are focused on reducing carbon emissions in various impactful ways, and include the following:

1. **Enhanced competitiveness:** By facilitating cooperation and knowledge exchange among its members, the Cleantech Cluster Lithuania enables clean technology companies to strengthen their competitive edge. This is vital for industries seeking to transition to low-carbon solutions.
2. **Innovation and research:** The cluster's commitment to R&D fosters the creation and implementation of cutting-edge clean technologies. These innovations, when applied across industries, significantly contribute to reducing carbon emissions.
3. **Economic growth:** A total of 705 million euro have been invested into the local cleantech sector. This underscores the pivotal role in accelerating economic growth. This growth includes the development and adoption of decarbonisation technologies and practices.
4. **Sectoral growth:** Notably, the energy, transportation, and resources sectors have thrived as a result of these investments, indicating that the cluster's activities directly impact key industries. These sectors often have substantial carbon footprints, making their transformation crucial for broader decarbonisation efforts.
5. **Internationalisation:** The cluster's support for internationalisation efforts facilitates the export of clean technologies and expertise, thereby amplifying their impact on global industrial decarbonisation.

In essence, the Cleantech Cluster Lithuania's strategic collaboration and focused efforts are instrumental in propelling both its member organisations and Lithuania as a whole toward a prominent position in the global arena of clean technology. By fostering economic growth, driving innovation, and promoting sustainability, the cluster plays a pivotal role in advancing the imperative of industrial decarbonisation.

Box 3. Experience of the Sunrise Valley Science and Technology Park in Lithuania

The industrial decarbonisation process is as much a journey of knowledge as it is of technology. By adopting a holistic, stakeholder engagement approach to the creation and dissemination of knowledge and expertise, industries can overcome the various challenges of this transition, creating a path that is not only environmentally sustainable, but also socially and economically viable.

6. Key MLE workshop insights from RTOs and industry

Industrial decarbonisation represents a profound shift in the global economic and environmental landscape. While the objective is clear, navigating the transition remains challenging. Insights from RTOs and industry representatives such as Worley, EARTO (European Association of Research and Technology Organisations), and the Confederation

of Lithuanian Industrialists, presented during the meeting on 19 September 2023, offer valuable perspectives on how this journey can be effectively managed. Here are the main general and industry-specific highlights, as presented during the workshop:

- **Regulatory stability and predictive regulation:** Regulation plays a pivotal role in shaping industry behaviour. The emphasis is on achieving "predictive regulation", where industries have a degree of clarity about what to expect. An uncertain regulatory landscape can influence industrial decision making, as seen in Lithuania with companies opting for alternative technologies in the face of escalating energy prices, where hydrogen technologies are not yet available. The implication is clear: industries make decisions based on cost-benefit analyses, and regulatory stability is a crucial element in this equation.
- **Awareness and communication:** Effective awareness and communication play important roles in the industrial decarbonisation process. While Energy Intensive Industries (EII) are generally aware of the imperative to decarbonise, Small and Medium-sized Enterprises (SMEs) sometimes lag behind in their awareness and understanding of this necessity. This discrepancy underscores the vital need for enhanced communication strategies aimed at educating and empowering SMEs regarding their crucial role in contributing to decarbonisation efforts. Moreover, it's worth noting that while the public may express support for decarbonisation in principle, there can be some resistance when it comes to taking concrete actions. This resistance to act can be influenced by multiple factors, including pricing, the availability of decarbonisation technologies, and the readiness of solutions for widespread adoption by consumers. Therefore, addressing this requires more than communication alone; it necessitates addressing the tangible barriers to action. Effective communication should not only inform but also inspire individuals and businesses to overcome these barriers, fostering a sense of agency and commitment to decarbonisation goals. Bridging the gap in communication means providing clear, accessible information and creating an environment where taking industry decarbonisation actions is not only understood but also facilitated and encouraged.
- **Citizen and NGO engagement:** Engaging citizens in the decarbonisation journey is paramount, and the role of NGOs and activists in this process is invaluable. While it is important to maintain a balanced approach, the insights and initiatives provided by these groups are essential in driving forward positive changes and aiming to foster a collaborative landscape where the public, NGOs, and industries work together seamlessly, leveraging the strengths of each stakeholder group to facilitate effective and sustainable decarbonisation processes.
- **Engineering company perspective:** The engineering company's role as a global player illustrates the power of practical, action-oriented strategies in contributing to a sustainable world. While adeptly using roadmaps from official authorities to shape their strategies, their most significant impact lies in aiding their industrial clients on the path to decarbonisation. This approach underscores an important message: real change often comes from hands-on implementation and support in projects, rather than solely from policy influence. An engineering company's focus on tangible projects, rather than policy advocacy, serves as a model for effective, ground-level action on sustainability.
- **EARTO's role:** EARTO act as a bridge between the public and private sectors, and in that role, emphasises the importance of R&D in industrial decarbonisation. EARTO stresses the need for alliances and Public-Private Partnerships (PPPs) to drive research, create sector-specific roadmaps, and identify technological gaps. EARTO argues that

the role of RTOs remains undervalued, though their integration in alliances and PPPs is crucial.

- **Confederation of Lithuanian Industrialist's viewpoint:** The Confederation stresses the importance of having unified targets among all stakeholders. While the will and technology to transition away from fossil fuels is present, costs remain a challenge. They also highlight the strategic importance of Europe in maintaining its industrial competitiveness, emphasising the risks of losing out to third countries in terms of competition, jobs and knowledge if this position is not maintained.

The discussion initiated after the presentations brought to light three interesting messages, as follows:

- **Barriers to industry engagement:** While there is consensus on the need for industrial engagement, barriers such as supply chain complexities, workforce shortages, and international subsidies continue to create challenges.
- **Legislative support:** Financial incentives are just one piece of the puzzle. Given the rapidly evolving global landscape, there is a call for streamlined legislative frameworks that can serve as a model for other nations.
- **Involvement of technology providers:** The role of technology providers and engineering firms, including those involved in initiatives like Processes4Planet, is pivotal in the global effort towards decarbonisation. They contribute significantly by offering innovative solutions and technological expertise. This collective effort highlights the importance of a cross-sectorial approach, demonstrating that the strength of the decarbonisation processes lies not just in individual companies but in the collaborative efforts of the industry. Acknowledging the contributions of various technology providers reinforces the message that a united front, encompassing a variety of players, is essential in effectively tackling the challenges of industrial decarbonisation. The workshop provided a wealth of insights, underscoring the complexity and multi-faceted nature of decarbonisation. It became clear that regulatory stability, continuous awareness, and effective communication, particularly towards SMEs, are fundamental to this effort. The crucial role of citizen and NGO engagement cannot be overstated, as their involvement is key to driving sustainable change and fostering a culture of collaboration and shared responsibility.

The perspectives shared by industry leaders and RTOs highlighted the necessity of a holistic approach, combining regulatory frameworks, innovative solutions, stakeholder engagement, and global cooperation. This approach addresses immediate challenges while paving the way for a sustainable and resilient industrial future.

The involvement of technology providers and engineering firms, as part of initiatives like Processes4Planet, was recognised as a cornerstone of industrial decarbonisation. Their contributions through innovative solutions and technological expertise exemplify the power of cross-sectorial collaboration. This collective effort demonstrates that the decarbonisation is the responsibility of individual entities as well as being a joint effort of the entire industrial ecosystem. A united approach is vital in effectively addressing the challenges of industrial decarbonisation, moving towards a more sustainable, inclusive, and environmentally conscious industrial landscape.

The MLE workshop, held on 19 September 2023, thus served as a crucial platform for sharing knowledge, aligning visions, and strengthening the determination to undertake this significant

but necessary transition. The insights gained here provide a valuable basis for navigating the complex pathways of industrial decarbonisation, notably highlighting the importance of collaboration, innovation, and a shared commitment to a sustainable future.

7. Key insights from the MLE countries

In the pursuit of industrial decarbonisation, various countries present distinct approaches in integrating actors and refining their strategies. These narratives are essential as they provide a multifaceted understanding of the challenges and potential solutions to a global concern.

Belgium's two regions, Flanders and Wallonia, (see

Box 4 and Box 5) presented their specific approaches. In **Flanders**, the establishment of multiple bodies, such as team-work platforms, consultative entities, and working groups, has been pivotal as these address the challenge of concurrently engaging diverse stakeholders. However, data sharing has emerged as a sensitive issue. Companies are often reluctant to share confidential information, which can hinder collaborative efforts. Involving citizens, while vital, also presented challenges.

Working together on VLAIO's Green Projects: A great way to do things (Flanders' Case)

VLAIO, a government agency in Flanders, is at the forefront of supporting innovation and entrepreneurship while addressing environmental concerns. Its mission bridges the realms of economics, science, and emerging discoveries to tackle pressing issues like climate change through collaborative efforts.

VLAIO has laid out an ambitious plan to promote environmental sustainability within industries. It actively seeks input from a wide spectrum of stakeholders, including major industries such as oil refining, chemical production, and steel manufacturing. Researchers, public officials, experts from diverse fields, and even ordinary citizens are invited to contribute their insights. This inclusive approach ensures that the voices of all those impacted by these plans are heard and considered.

To benefit from VLAIO's support, companies must demonstrate genuine commitment to environmental responsibility, going beyond mere token gestures to effect meaningful change. VLAIO acts as a repository for these innovative proposals, consolidating a wealth of smart ideas in one central hub.

Furthermore, VLAIO collaborates with significant European initiatives, aiming not just for financial gain but also to engage the people of Flanders in collaborative knowledge-sharing and participation in major European endeavours.

One standout initiative by VLAIO is the "Climate Leap," which represents more than just a plan—it embodies the vision of a greener future where Flemish businesses take the lead. This program harmonizes financial success with environmental stewardship.

In essence, VLAIO exemplifies the power of collective effort in driving substantial green transformations. It serves as a real-world testament to how teamwork can translate into a greener reality.

Box 4. Working together on VLAIO's Green Projects: A great way to do things (Flanders' Case)

Wallonia, on the other hand, emphasised the necessity of achieving equilibrium among large corporations, and SMEs. A significant achievement was the formulation of a dialogue tool fostering interaction between public and private actors. This tool has been recognised as a valuable platform for mutual learning, drawing inspiration from the Moonshot initiative in Flanders.

Engaging stakeholders in the Walloon Low Carbon Industry Roadmap: A collaborative approach to decarbonisation

The initiative “Walloon Low Carbon Industry Roadmap” is the product of joint effort of Wallonia's industry and policy makers. This roadmap shapes the region's development towards a greener industrial landscape and can be a good example for other regions and countries.

Central to the roadmap's success is its integrative approach. By weaving together insights and strategic orientation from various initiatives like the National Energy and Climate Plan, the Plan Air Climat Énergie, and numerous EU and regional roadmaps, Wallonia underscores the significance of a united front. By drawing from such diverse sources, the roadmap contains a holistic view of the challenges and solutions for industrial decarbonisation.

Inspired by Flanders' Moonshot initiative, Wallonia aims to support research and new low-carbon ideas. Thanks to funding from the Recovery and Resilience Facility, Wallonia has the resources to help its industries, especially SMEs, become more environmentally friendly. This shows that Wallonia is serious about making positive changes and wants to be a leader in this area.

Leading this effort is a group called "WE". Their main job is to guide the work based on the roadmap. They also take care of things like managing contracts and checking detailed studies to make sure everything is done correctly and openly.

Wallonia's government has set up a diverse team to work on the roadmap. This team, made up of people from the public and private sectors, is working hard to make sure the roadmap is clear and effective – a real plan for talking and doing things differently.

The roadmap is built on a few main ideas:

- **Technology:** Looking at new technologies to see how they can help reduce pollution, improve industries, and adapt to new rules.
- **What helps and what doesn't:** Finding out what will make it easier to use these technologies and what might hinder their application and uptake.
- **Using computers and the internet:** The roadmap looks at how digital tools can help businesses, especially SMEs, become greener.
- **Key steps:** The roadmap sets out the important steps to take from now until 2030, with the big aim to be fully green by 2050.
- **Advice:** Giving tips and guidelines to people in charge so they can make good decisions, tackle problems, and make the change smooth.

As Wallonia started this new project, different groups and officials teamed up, showcasing their interest in pursuing change. All stakeholders involved are looking forward to making real progress and getting good results.

Wallonia's roadmap is a great example of how areas can plan and work together for a greener future. With everyone chipping in, Wallonia's goal to reduce industrial pollution shows it's not just a local plan, but an inspiration for everyone around the world.

Box 5: Engaging stakeholders in the Walloon Low Carbon Industry Roadmap: A collaborative approach to decarbonisation

Türkiye underscored the significance of public stakeholder inclusivity in their example (see

Box 6). Communication, though primarily through official channels, remains robust, but there have been challenges in certain sectors among the EII, such as fertilizers, due to past experiences and concerns about data confidentiality.

Green Growth Technology Roadmap of Türkiye

The "Green Growth Technology Roadmap of Türkiye" reflects the country's comprehensive approach to drive industrial decarbonisation growth across pivotal sectors such as iron & steel, aluminium, cement, fertilizers, and chemicals. This roadmap is constructed building upon meticulous stakeholder engagement and planning to ensure cohesive and collective efforts.

Under the auspices of the Technological Transformation/Development Specialized Working Group, 100 participants from 43 institutions collaborated, leading to three pivotal meetings in April, August, and October 2022. The diverse stakeholder body consists of public stakeholders, including notable institutions like the Turkey Presidential Digital Transformation Office and the Ministry of Environment. Additionally, internal stakeholders encompassing ministries associated with industry, commerce, and technology, and 27 umbrella NGOs representing various trade and industry associations, have been integral in this process.

The roadmap follows a structured approach beginning with the establishment of governance groups. The Technological Transformation/Development Specialized Working Group involved public institutions, private sector NGOs, sectoral expert groups, and an advisory group of established researchers at its core.

A primary objective is to align with the European Green Deal, emphasising green transformation within select pilot sectors. This necessitates extensive R&D and innovative solutions that work in tandem with the Climate Council Science & Technology Commission Circular Economy Group Studies.

To ensure sectoral compliance with the European Green Deal and to identify technological solutions, engagement with sectoral focus groups is crucial. This engagement assists in pinpointing essential production technologies, processes, and inputs. To gather comprehensive data, surveys are employed targeting manufacturers, infrastructure providers, suppliers, and more. The collective data from these efforts is structured and made accessible to industry representatives, umbrella NGOs, technology providers, and other industry participants.

The roadmap's progression leads to the consolidation of the information collected from focus groups and surveys. This phase seeks valuable contributions from academic and research institutions to finalise the acquired data in consultation with the advisory group.

Subsequently, the roadmap focuses on harnessing existing technological expertise from companies and research institutions. The aim is to nurture and develop nascent technologies, further promoting R&D and innovation. The roadmap culminates with the "Green Growth" Thematic Call in the autumn of 2023.

The content of the Green Growth Technology Roadmap is exhaustive and detailed. Emphasis is on Research, Develop and Innovation (RDI) topics, collaboration across various sectors, listing feasibility concerns, and referencing Technological Readiness Levels (TRL) globally and in Türkiye. The roadmap advocates for RDI cooperation models and meticulous time and resource planning.

Ultimately, the roadmap's central theme revolves around consolidating inputs from a myriad stakeholders via diverse resources. This concerted effort is essential for fostering a collaborative environment to achieve technology goals underpinning green growth in Türkiye.

Box 6. Green Growth Technology Roadmap of Türkiye

Slovakia's narrative (see Box 7) has been one of introspection and outreach. Without initially having a systematic approach to strategic policymaking, Slovakia has recognised the necessity of understanding its industrial ecosystem.

Engagement of stakeholders: R&I policy in Slovakia

In Slovakia, the development and implementation of research and innovation (R&I) policy has been executed through an elaborate process that puts a spotlight on inclusive stakeholder engagement.

The process began with an intense immersion into the "ecosystem" of R&I. This involved deep research where 100 in-depth interviews were conducted, spanning a wide array of stakeholders, from businesses to researchers, and even students. Aiming to make the policy-making process as inclusive as possible, an event was organised on the co-creation of policies. This gathering served as a platform to interact with and engage 90 end-users, ensuring that the resulting policies were both relevant and practical. To foster a continuous dialogue with the community, a public consultation phase was introduced. This move was met with immense enthusiasm, as evidenced by the reception of an impressive 700 comments from the community, highlighting an active participation from the public and their eager commitment to shaping the policy.

The process then culminated in the so-called "VAA Analysis." This step involved a study of existing strategies within Slovakia. The intent here was twofold: to ensure that the new policies were in harmony with existing strategies and to incorporate tactics that had proven effective in the past. Furthermore, to ensure that Slovakia's R&I policies remained at the forefront of global innovation, the team looked beyond its borders, researching best practices from other nations.

The role of institutions in shaping the R&I policy was very important. The team engaged in comprehensive consultations, including government and public actors, industry, and

employers' unions. Through roundtable discussions, they analysed topics including, among others, financing R&I. To make certain that the strategy was well-aligned with government goals, they developed a Consulting Strategy Concept in tandem with various government departments. To refine the strategy, preliminary comments were invited, followed by cross-departmental comment proceedings. Once the strategy was created, it underwent a robust approval process, with its final ratification coming from the government after an initial approval from the Council for Science, Technology, and Innovation.

Underpinning this entire process were some core principles that the strategy aimed to uphold. Talent was placed at the forefront, with a keen emphasis on recognising and harnessing the vast pool of human resources and expertise. There was a firm belief in ensuring adequate funding, but this was to be done with the utmost transparency, accountability, and proper allocation. Lastly, the strategy emphasised the significance of aligning all stakeholders towards shared goals and objectives to achieve a harmonious and coordinated effort.

In essence, Slovakia's good practice in the realm of R&I policy development and implementation stands as a testament to the importance of a cohesive, inclusive, and comprehensive approach. It's a model that lays great emphasis on stakeholder engagement, meticulous research, and a collaborative spirit, all anchored in a set of core principles that prioritise talent, strategic investments, and a unified mission.

Box 7. Engagement of stakeholders: R&I policy in Slovakia

As a smaller nation, talent acquisition and retention become paramount for strategic success. Collaborating with more established Western European countries provides invaluable insights. However, it's essential to clarify that while expanding stakeholder inclusion is highly valuable, it can sometimes limit individual contributions and opportunities for involvement.

The ensuing discussion revolved around essential inquiries. These pivotal questions aim to discern the leadership dynamics and coordination challenges encountered, which can vary significantly across regions and sectors. Here are the key insights from the discussion:

- The workshop underscored the dynamic role of **industry associations** in shaping the decarbonisation roadmap. Unlike traditional lobbying entities, these associations actively engage in interactive and collaborative efforts. Their focus is on clarifying complex industry interactions, sharing aspirations and goals, and fostering a unified vision. This entails drafting cooperation proposals and participating in strategy development. Often, the entity most directly affected by decarbonisation challenges initiates these actions. The active involvement of associations signifies a shift from singular focus to a more inclusive and cooperative approach, essential for comprehensive and effective decarbonisation strategies.
- **In Portugal**, the ministry and the agency responsible for the Recovery and Resilience Plan (RRP) play a central role in roadmap development. While sectoral roadmap calls under the RRP are ongoing, making final outcomes uncertain, the intention is clear: to involve all sectors.
- **Belgium-Wallonia** advocates for a dynamic leadership model, emphasizing mediation over a fixed leadership approach. They propose that the driving seat should shift among different stakeholders based on the situation's demands.

- **Slovakia** champions a multifaceted engagement approach, emphasizing the need for collaboration beyond industry boundaries. Their emphasis on implementing a comprehensive government approach as a success metric underscores the importance of collaboration beyond industry alone. Engaging associations fosters a sense of ownership, while incorporating sectors like design, culture, and creative industries is deemed vital for a holistic decarbonisation approach. From Slovakia's perspective, a multidisciplinary approach is not just beneficial but also necessary.
- **Türkiye** places its ministries at the forefront of decarbonisation efforts, with the specific ministry varying depending on the topic. The industrial sector, particularly in areas like steel, displays notable proactivity. However, challenges emerge in sectors like fertilizers, characterized by more complex engagement. This variation is attributed to each sector's distinct nature, past interactions with public institutions, and industry concerns related to data confidentiality.

In conclusion, the process of industrial decarbonisation is a multifaceted endeavour. Leadership, which can vary across regions and sectors, must be flexible, inclusive, and strategic to address the diverse challenges posed by this transition.

During the discussion, the emphasis was not only on leadership but also on the role of **mediation**. Shifting the leadership role between various actors enhanced the dynamism. A recurring theme was the fluctuating focus between urgency and sector-specific challenges. While some sectors experienced proactive engagement, others lagged due to data-sharing concerns or as a result of the negative past experiences.

The workshop emphasized the significance of the **supply chain's role** and the importance of **international collaboration**. A comprehensive perspective on sectors can yield extensive solutions, including several sectors. The value added does not solely originate from resource allocation within the supply chain but also through territorial cooperation. Cross-sectoral advancements were identified as significant, with technologies being developed in a cross-sectoral manner before their implementation in a specific sector.

On the topic of **communication**, a multi-faceted approach appears to be most effective. While formal channels have their place, platforms such as LinkedIn and informal communication spearheaded by articulate experts have proven to be particularly effective. Spain, while echoing the importance of communication, also emphasised the necessity for transparency across all engagements.

Incorporating these perspectives, it is evident that while challenges persist in the journey towards industrial decarbonisation, collaborative approaches, knowledge sharing, and innovative leadership dynamics can lead the way forward. As the global community ventures deeper into this transition, the shared experiences and lessons from these countries can serve as vital examples.

8. Conclusion

The process towards industrial decarbonisation is complicated, encompassing a broad spectrum of global production and consumption systems. It is crucial to recognise supply chain stakeholders as central in this transition. This thematic report underscores this viewpoint, acknowledging that each stakeholder, regardless of their geographic or sectoral position, forms a part of this extensive network. This perspective brings to the forefront the collective responsibility to reduce emissions, where every link in the supply chain, as well as cooperation across supply chains, play an important role.

Therefore, the approach to industrial decarbonisation must be holistic and inclusive, ensuring that the responsibilities and impacts are distributed fairly among all stakeholders. The report reaffirms the need for an equitable transition, where no party bears an undue burden or is neglected in the process. By integrating this supply chain perspective throughout, this report not only highlights the role and importance of interconnectedness but also calls for unified action to achieve meaningful and balanced decarbonisation across all sectors.

Diverse stakeholders, spanning from industries to the individual consumer, hold immense power in shaping the trajectory of decarbonisation. Their roles are distinct, yet their collective actions, insights, and resources forge the path to meaningful carbon reductions. Governments, in particular, can shape industry behaviour through dynamic policy frameworks, while financial institutions can channel green finance to push industries towards more sustainable operations.

In this vast tapestry of change, communication brings everything together by serving as a bridge between diverse entities, fostering understanding and collaboration. For the trajectory of industrial decarbonisation to be smooth and effective, communication must be clear, consistent, and transparent. It must unify varied stakeholders, allowing them to march towards a shared objective: carbon neutrality.

The success of industrial decarbonisation relies on the availability of knowledge and competence, in addition to technologic advancements. The nuances of this transition lie beyond mere technology; they encompass social, economic, and cultural facets. As industries pivot, it becomes clear that the journey towards carbon neutrality is about innovation and the need to combine it with profound understanding and expertise. Knowledge-sharing becomes paramount. Stakeholders, from local communities to global experts, bring a diverse pool of knowledge, ensuring that the challenges of decarbonisation are met with a holistic approach. Governments and educational institutions solidify this foundation by fostering an environment that values environmental awareness and continuous learning.

9. The way forward to achieve impact

In this section, the main takeaways from the 19 September 2023 MLE meeting and the White paper developed by the group of MLE experts are summarised to allow for reflections to be brought forward during the open discussions in the next meetings of the MLE and inform the final recommendations of this MLE.

The role of SMEs

SMEs are fundamental pillars of most economies, often contributing significantly to employment, innovation, and economic dynamism. In the realm of industrial decarbonisation, their role has only grown in importance. While larger corporations have traditionally been at the forefront of technological advancements, SMEs have proven agile and innovative, swiftly adopting sustainable practices and technologies. Spain's initiative on supporting industries associated with renewable energy equipment and industrial decarbonisation is exemplary, showcasing how SMEs can be integrated into the broader sustainability context. Furthermore, in the evolving paradigm of the circular economy, SMEs hold significant potential to act as intermediaries, converting waste from one industry into raw materials for another, thus reducing carbon footprints. Regarding financial instruments, an emphasis on inclusion of SMEs is crucial. Collaborative engagement with industry associations, as opposed to singular entities, can yield broader, more encompassing solutions, ensuring no stakeholder is left behind.

Lack of links to Public-Private Partnerships (PPPs)

In the industrial transformation, PPPs such as Processes4Planet, Clean Steel, and Made in Europe play a crucial role in fostering innovation and bridging resource gaps across Europe. Yet, a notable concern arises as a result of the disconnect between the strategic directions of these PPPs and national policies. While PPPs possess substantial expertise and resources, their potential to directly align national policies with global sustainability goals is limited. This underscores a need for a systems approach in harmonising the efforts of PPPs with national roadmaps.

To address this gap, a joint effort is needed to facilitate better communication and collaboration between PPPs and national policies. This involves creating platforms for dialogue, sharing best practices, and developing joint strategies that acknowledge the unique contributions of PPPs while aligning them with national priorities and sustainability objectives. Such collaboration could lead to a more cohesive and effective approach in achieving decarbonisation goals.

Cooperative approach to policymaking

The impact of collaboration among industry stakeholders can be significantly enhanced by broadening the spectrum of engagement. This includes involving the sector related actors in a manner that shifts from traditional lobbying tactics to a more proactive and cooperative approach to policymaking. Such a strategy encourages the adoption of policies that are not only beneficial to individual sectors but are also in line with broader societal and environmental goals.

International collaboration

In an increasingly interconnected world, international collaborations have emerged as powerful tools, especially for smaller nations or regions. Such collaborations allow for resource sharing, collective problem solving, and harmonised policy frameworks. As noted by Wallonia (BE), this collaborative approach can also provide flexibility in navigating complexities like state aid rules, ensuring that smaller regions or countries are not left behind on the road towards decarbonisation.

Research and academia

Academia plays an indispensable role in promoting industrial decarbonisation, encompassing scientific research, innovation, and knowledge dissemination. However, there are notable differences among academics, with some prioritizing theoretical research and others emphasizing practical impact. These differences may include research focus, available resources, technology readiness levels, regulatory environments, and industry partnerships. Collaborative initiatives are essential to bridge these gaps and foster a shared understanding of decarbonisation challenges and opportunities.

One approach to addressing this gap is to encourage international research collaborations. This involves establishment of partnerships between academic institutions from various countries, allowing them to combine expertise and resources. Additionally, creating platforms for knowledge sharing enables academics to exchange insights, best practices, and research findings, contributing to a common knowledge base.

Standardization efforts can further promote consistency in research methodologies and approaches across borders. By developing international standards and guidelines for decarbonisation research, academia can ensure that research outcomes are more comparable and applicable on a global scale.

Capacity building is another vital aspect of addressing the gap in academic approaches. Supporting academic institutions in countries with fewer resources can enhance their capabilities in decarbonisation research and technology development, promoting more equitable participation in the global effort.

Finally, fostering policy harmonization by aligning decarbonisation-related policies and regulations across nations can create a more cohesive research environment. This alignment facilitates smoother international collaboration and enhances the impact of academic research on industrial decarbonisation worldwide.

These insights underscore the necessity of a multifaceted, inclusive, and collaborative approach for successful industrial decarbonisation. By considering the unique challenges and opportunities presented by each stakeholder, a coherent strategy can be formulated to ensure holistic progress towards a sustainable future. Additionally, it is worthwhile to explore the interconnection between challenge-oriented and blue-sky research, as focusing on specific challenges can concentrate efforts and lead to faster progress, while maintaining a connection to blue-sky research may inspire entirely new research methods.

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The third thematic report has been prepared in the context of the Mutual Learning Exercise (MLE) on Industrial Decarbonisation involving 12 committed participating countries. The report, entitled "Actors' Engagement," presents a detailed examination of the varied roles played by different stakeholders in the process of industrial decarbonisation, encompassing enterprises, governments, and community groups. This report is structured to offer a thorough understanding. It incorporates the insights, gathered from the third MLE meeting that took place virtually on 19th September 2023.

Studies and reports

