European Commission

Policy-mix for R&I investments in deployment and uptake of low-carbon technologies

Mutual Learning Exercise on Industrial decarbonisation

Second thematic report

PSF CHALLENGE

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Research and Innovation

Policy-mix for R&I investments in deployment and uptake of low-carbon technologies. Mutual Learning Exercise on Industrial decarbonisation

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Policy-mix for R&I investments in deployment and uptake of low-carbon technologies

Mutual Learning Exercise on Industrial decarbonisation

Second thematic report

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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 learned and provide guidance to policy makers on how to develop or update their industrial technology roadmaps and sector-specific strategies for industrial decarbonisation[1,2].

This thematic report has been prepared as a result of the second meeting of this MLE, held on 29-30 June 2023 in Vienna.

1. Background

In line with the first European Research Area (ERA) Industrial Technology Roadmap,[3] this MLE aims to share and discuss specific national sectoral and cross-sectoral strategies or programmes with key stakeholders as part of the ERA Policy Agenda 2022-2024. Austria, Belgium (Flanders and Wallonia), Finland, Georgia, Latvia, Lithuania, Portugal, Slovenia, Slovakia, Spain, Sweden and Türkiye have made a commitment to this MLE.

The first ERA industrial technology roadmap, published in April 2022, focuses on low-carbon technologies in Energy Intensive Industries (EII). It evaluates the current state of play of relevant technologies and support instruments in the EU. The roadmap shows a gap between research and innovation (R&I) investments and the emission targets of the European Green Deal. The transition to a climate-neutral economy by 2050 requires transformation in all sectors, including reducing emissions in EII, which accounted for 17% of the EU's total emissions in 2019. The roadmap also indicates that some European Union (EU) Member States (MS) have already created decarbonisation strategies for EII in partnership with relevant stakeholders. These strategies are important tools for designing a detailed process with milestones towards commonly agreed emission reduction targets.

In response to the challenges posed by Russia's war of aggression against Ukraine and disruptions in the global energy market, the European Commission has introduced the REPowerEU Plan in May 2022. Under this plan, the Recovery and Resilience Facility (RRF) will support Member States in introducing critical reforms and investments to reduce the EU's dependency on Russian fossil fuels and foster zero-carbon sources and energy resilience. The European Commission also proposed a Net-Zero Industry Act on 16 March 2023 with net-zero technology objectives for 2030, focused on strategic projects and simplified permitting for new net-zero technology production sites. Furthermore, a new REPowerEU chapter of the Recovery and Resilience Plans was proposed on 27 February 2023 as an amendment to the RRF Regulation 2021/241. An additional EUR 20 billion in grants will be made available to finance investments and reforms. Member States are encouraged to include in their REPowerEU chapters measures with a cross-border or multi-country dimension or effect for an amount representing 30% of their REPowerEU Chapter.

[1] Factsheet: Industrial decarbonisation - Publications Office of the EU (europa.eu)
[2] 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 E.1 –– 'Industrial Research, Innovation and Investment Agendas' oversees the work, with the support of E3 –– 'Industrial Transformation' of the Prosperity Directorate, DG Research and Innovation.
[3] ERA industrial technology roadmap for low-carbon technologies in energy-intensive industries (europa.eu)

The MLE on Industrial Decarbonisation, and specifically the Second Thematic report, will explore if, and to what extent, the supporting activities mentioned above are influencing national strategies with regard to industrial decarbonisation. In addition, it will be used as a platform for dialogue and exchange of good practices with participating countries on their specific interests and needs, and it will provide input to national policy decision-makers.

2. Objectives

The MLE on Industrial Decarbonisation is expected to contribute to achieving the European Green Deal objectives and to follow-up on one of the actions of the first 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 will provide best practices and models, as well as relevant framework conditions, for mobilising private and public investments in low-carbon technologies in energy-intensive industries (EII) and their deployment with the objective of supporting the green transition and achieving net-zero emissions.

The MLE is organised into several rounds of meetings on specific topics proposed by the European Commission in the ERA Forum in October 2022 and refined after a consultation process with the participating countries during an online scoping workshop on 12 December 2022.

The four topics of the MLE on Industrial Decarbonisation are as follows:

- 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 on 29-30 June 2023 in Vienna (Austria), focusing on Topic 2. The third meeting took place on 19 September 2023 (online, Topic 3), while on 28-29 November, the fourth meeting on Topic 4 of the MLE will take place in Lisbon (Portugal). The final meeting (online) will be organised in January 2024 to wrap up the findings of the MLE. A dissemination event is envisaged to take place in end-March in Belgium, (hybrid meeting The dissemination event of the Industrial Decarbonisation MLE is planned under the Belgian Presidency of the Council of the European Union.

3. Structure of this report

In this second thematic report (Topic 2 'Policies, design, and financing for R&I investments in development, uptake, and deployment of low-carbon technologies') the focus is on exploring the building blocks constituting a **policy-mix** through a literature review (section 2.1). The elaboration of the policy-mix concepts will be associated with the importance of

operationalising the approach for the effective uptake and deployment of low-carbon technologies.

The report reflects the **discussions and outcomes of the second meeting of the MLE**, held on 29-30 June 2023 in Vienna. With respect to the policy mix and its operationalisation, these discussions focused on the design and potential impact of national support programmes and initiatives as well as support for industrial decarbonisation and demonstration projects under the RRF, state aid programs and regulatory framework, Small and Medium-sized Enterprise (SME) support programmes, European Regional Development Fund (ERDF), among others. Another meeting objective was to explore and discuss various financing instruments as well as the mobilisation of public and private R&I investments for climate neutrality (e.g., investment pipelines, First-Of-A-Kind (FOAK) installations, and Important Projects of Common European Interest (IPCEI)).

In order to capture more insights from the national strategy/industrial tech roadmap design, financing mechanisms, and the mobilisation of R&I investments, a **survey** had been prepared to the attention of the MLE participating countries, which gathered replies before the meeting took place. The results of the survey were discussed at the meeting in Vienna and are summarised in section 2.2 of this report, together with a summary of the panel discussion, held on the second day of the meeting. Annex I includes the full responses of MLE countries to the survey questions.

Section 2.3 is focused on summarising the presentations of four countries (Austria, Spain, Portugal, and Georgia), on their strategies and approaches to policies for industrial decarbonisation, while Section 2.4 focuses on the panel discussion with industry representatives and their efforts towards and investments in decarbonisation.

Section 3 of this report presents a first list of conclusions on the discussions during the meeting in Vienna, while Section 4 lists a series of points for discussions, representing observations to be taken forward by the following meetings.

Annex II presents more details on the national strategies of four participating countries' presentations (Austria, Spain, Portugal, and Georgia).

POLICY MIX AND FUNDING

In this section, a deeper dive into the concepts and challenges of the policy-mix and funding are provided, as well as a summary of the discussions that have taken place during the 2nd MLE meeting in Vienna on 29-30 June 2023 on Topic 2 ('Policies, design and financing for R&I investments in development, uptake and deployment of low-carbon technologies').

Firstly, an overview of the context is offered looking at the policy mix in terms of its elements, processes and characteristics and how those building blocks can be correlated to the first Thematic Report and to the specific topic discussed during the 2nd Meeting in Vienna. Secondly, the results from the survey circulated in preparation of the meeting in Vienna are outlined, followed by a summary of discussion points, raised during the industry panel. Finally, the main relevant points that emerged from the countries' presentations during the Vienna meeting are outlined.

The complexity associated with the inherent nature of this topic, and the interdependency between the different policy instruments is reflected in this report. The importance of identifying an approach that will take into account regulatory, economic, financial and soft instruments is evident from the summary of interventions by MLE countries. This aligns with the most accepted approach in public policy design that will have an impact on the decarbonisation transition[4].

4. Policy mix: Building blocks and their interplay for an effective operationalisation

As presented in the study commissioned by the European Commission to investigate the effectiveness of policy mixes for research and innovation (R&I) the accepted definition of a policy mix refers to "the combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors"[5]. The definition has been further extended to include three basic requirements: first, the inclusion of a strategic component, second the incorporation of associated policy processes and third, the consideration of the characteristics of policy mixes. Based on these requirements, three building blocks are proposed, namely elements, processes, and characteristics. Each of these building blocks are discussed in more detail in the following sections.

4.1. Elements

The 'elements' building block of a policy mix includes a policy strategy, policy instruments and instruments' interactions or instruments' mix. These elements have been discussed during the meeting in Vienna, prompted by a survey prepared and circulated beforehand between the participating countries.

[4] (a) H.A. de Bruijn, H.A.M. Hufen, The traditional approach to policy instruments, in: G.B. Peters, F.K.M. Nispen (Eds.), Public Policy Instruments. Evaluating the Tools of Public Administration, Edward Elgar, Cheltenham, 1998, pp. 11–32. (b) L.M. Salamon, The tools of government, A Guide to the New Governance, Oxford University Press, Oxford, 2002.

[5] C. Nauwelaers et al., Policy mixes for R&D in Europe Eur. Comm. Res. Maastricht. (2009)

4.1.1. Policy strategy: National Strategic Roadmaps

As amply discussed in the first thematic report of this MLE, the need for roadmaps at national and European level is evident for decarbonisation as it supports the definition of a clear timeline, specific objectives and targets, and innovations pathways. Based on the analysis presented in the first thematic report, almost all National Strategic Roadmaps of the MLE participating countries are aligned with activities at European level. Policies and measures at European level provide goals and a framework for the design of roadmaps at the national level. Most countries use long-term modelling exercises to define different trajectories, pathways and scenarios for the decarbonisation of industry. The results of this quantitative approach deliver an important building block for the identification of specific R&D and technological development needs and the definition of Research Technology and Innovation (RTI) policies. The long-term perspective is crucial in defining a policy strategy[6] and plays a fundamental role in providing actors with the necessary guidance in their search and can thus clarify the specific objectives among technology users within innovation ecosystems[7]. For example, research has shown the vital role of ambitious and stable long-term climate targets in steering R&D activities of companies in the energy sector[8]. However, the same research has also pointed out that this strategic element of the policy mix on its own is not sufficient to change companies' innovation strategies and that it needs to be operationalised through concrete policy instruments.

In the morning session of the Vienna Workshop on 29 June 2023, the MLE members discussed how roadmaps can best be developed so that they achieve an impact on policy making, and what countries can learn from each other in this regard. After a presentation of the first thematic report about national strategies and roadmaps by the Rapporteur Karl-Heinz Leitner, some topics were elaborated in more depth, as described below.

4.1.1.1. Ensuring commitment from the industry

While in a number of countries, a high level of commitment from the side of the industry is a given, building on a long tradition of industry representatives engaging in consultation and public-private stakeholder processes, some countries faced challenges to convince industry to participate in the strategy/roadmap development process. The importance of involving industry from the beginning of the roadmap development was amply articulated by Lithuania's country expert, giving details of the process in place. Lithuania stated that the country always tries to define clear problems as a starting point, which are addressed in the roadmaps with the perspective of defining short-, medium- and long-term perspectives for their resolution. Thereby, it also avoids seeing a roadmap as a lobbying exercise. The Lithuanian country expert described this as a bottom-up or grassroots approach involving already, from the beginning of the process, the industry to hear their voice and problems. The task of roadmapping is also essential to translate often technical and complex themes into a language understood by the public.

4.1.1.2. Role of academia and science-industry relationships

The first thematic report already stressed the importance of the involvement of academia in accelerating decarbonisation, highlighting also that Research and Technology Organisations (RTOs) play an important role in bridging academia and industry. A strong industry-academia

[6] Hillman, A.J., Hitt, M.A., 1999. Corporate political strategy formulation: a model of approach, participation, and strategy decisions. Acad. Manage. Rev. 24, 825–842.
[7] Hekkert, et al., 2007. Functions of innovation systems: a new approach for analysing technological change. Technol. Forecast. Soc. Change 74, 413–432.
[8] Schmidt, et Al., The effects of climate policy on the rate and direction of innovation: a survey of the EU ETS and the electricity sector. Environ. Innov. Soc. Trans. 2, 23–48.

linkage provides the basis for a strong innovation ecosystem by ensuring that research and development activities in universities are oriented towards market and societal demand. Industry will benefit by gaining access to complementary technological knowledge (including patents), by tapping into a pool of skilled workers, by gaining access to the university's facilities and equipment, and by bringing in a long-term perspective about technological opportunities. However, in some countries, there is still a lack of collaboration between academia and industry, which hampers an effective development of a roadmap. At the same time, the roadmapping process, when mediated by public authorities, can also be considered as a chance to establish academia-industry relationships.

4.1.1.3. Participation of Non-Governmental Organisations (NGOs), Civil Society Organisations (CSOs) and similar stakeholders

The analysis of the country strategies and roadmaps revealed that all countries adopted a highly participatory process, engaging a wide range of stakeholders. The discussion pointed towards the importance of inclusive and collaborative processes, involving industries, academia, and policy experts. However, in the MLE workshop, the role of, and necessity to, involve NGOs, CSOs, labour unions, and citizens right from the beginning was also discussed. The transformation of industry is fundamental, which can only be successfully realised if all stakeholders are involved and jointly shaping possible transformation pathways. Institutions bringing in the interest of citizens, customers and employees can ensure that measures in relation to education, training, awareness raising, product labelling, energy use, consumer patterns and so on can be effectively designed, and possible barriers and resistance can be reduced. In this context, the concept of Just Transition[9] and funding possibilities at the European level need to be promoted as a strong instrument, that can help in reducing the gap between innovation leaders and emerging innovators.

4.1.1.4. Role of SMEs and platforms

During the discussion, the need for, and sometimes difficulties in, involving SMEs was flagged. Despite acknowledging that SME's decision-making processes are more flexible and efficient than large corporations in response to market trends and hence may accelerate the uptake of technological innovations, their role in the development of roadmaps is still undervalued. Some countries have specific strategies for SMEs. Georgia, for instance, has a number of specific measures addressed towards SMEs in its national strategy. In addition, technology platforms on the national and international level as well as cluster organisations, which are very active in many countries, have proven to be a helpful tool to involve SMEs.

4.1.1.5. Inter-ministerial collaboration

Roadmapping exercises are often initiated by government authorities. However, the decarbonisation of industry requires a policy mix that encompasses R&D, industry, geography, energy, infrastructure, environment, and education, and, therefore, requires coordination between different policy fields and the relevant sectoral ministries. Some countries stressed the need to involve all relevant ministries in order to fully cover the different policy fields and ensure their political commitment. Austria presented a new and comprehensive programme promoting industrial transformation that integrates R&D and investment policy and illustrated how this is currently implemented. In Austria, the Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology brought

[9] The Just Transition Mechanism (JTM) is a initiative undertaken by the European Union as one of the funding actions within the European Green Deal policy. It represents a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. It provides targeted support to help mobilise around €55 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition.

together the agenda of two former ministries which helped in the alignment of different policy domains.

4.1.1.6. Energy supply and availability of resources

The analysis of the strategies and roadmaps at the national level has shown that natural and energy resources are also considered in the course of the roadmapping exercise. During the discussion, the crucial role of energy supply was mentioned several times with hydrogen, biofuels, and biomass being highlighted as important novel sources.

4.1.1.7. Collaboration between (neighbouring) countries and regions

The first thematic report concluded that there is hardly any collaboration between countries and that this can be considered as a weakness. The discussion among the MLE member representatives highlighted that opportunities should be further exploited in the future, especially at the level of energy management, hydrogen valleys and Hubs for Circularity (H4C) via Communities of Practice[10].

4.1.1.8. Investment needs and alignment with activities at the European level

Another critical factor in driving successful technological advancements and sustainable industrial growth was the coming together of R&D efforts with investment and industrial policies. While all roadmaps have defined the need for investments, there is less evidence of specific investment instruments, strategies and policies that have been put in place. The participants stressed that de-risking measures, in terms of financial de-risking (i.e. debt, equity and guarantees that will spread the risk between participating parties or will transfer the risk to a third party) and policy de-risking, are important to reduce uncertainties for industrial decision-making. While there is some experience in aligning national and European R&D policies, e.g., in setting priorities for the Framework Programmes, there is less experience and a lack of established coordination processes for aligning national, transnational and European investment strategies and interests. The discussions during the workshop made it clear that there is a need for further information exchange and coordination on (new) funding opportunities, especially for investments in demonstration and FOAK facilities, as well as for higher Technology Readiness Levels (TRLs). Instruments such as the RRF, Innovation Funds, Emissions Trading System (ETS), state aid, and General Block Exemption Regulation are relevant in this context.

4.1.1.9. Public communication, awareness raising and visibility

The MLE experts welcomed the initiative by the European Commission to develop a database of demonstration projects across Europe, which could facilitate further alignment of investments and policies between different countries. Participants also stressed that it is possible to communicate the existence and the mapping of these demonstration projects to a wider audience and public, which could also contribute to further awareness-raising on a broader scale. This discussion is in line with the debate, which took place at the kick-off workshop in April 2023, where it became clear that successful industrial decarbonisation strategies also need narratives and illustrative best practices to convince society.

[10] https://cordis.europa.eu/project/id/101058416

4.1.2. Instruments

It has long been acknowledged that a combination of technology-push and demand-pull instruments are recommended for stimulating innovation[11]. In addition, systemic instruments have been proposed to complement more traditional innovation policies[12]. In the following table a list of three types of instruments are proposed, namely economic, regulatory, and information-based instruments. Three main purposes under pin these instruments, namely technology-push, demand-pull, and systemic concerns, in the view of combining both energy and innovation policy instruments.

Primary Instruments	Primary Purpose		
	Technology-push	**Demand-pull**	**Systemic**
Economic Instruments	R&D grants and loans, tax incentives, public equity assistance	Subsidies, feed-in tariffs, trading systems, taxes, levies, deposit-refund-systems, public procurement	Tax and subsidies reforms, infrastructures provisions, cooperative R&D grants
Regulation	Patent law, IPR	Technology/performance standards, application constraints	Market design, priority feed-in
Information	Professional training and qualifications	Training on new technologies, public information campaigns	Education system, clusters, thematic meetings, cooperative R&D programmes

Table 1. Policy instruments typology based on type of instruments and primary purpose.
Source: elaboration based on[13] .

4.1.3. Instruments' interactions

Moving from single instruments to their combination brings us to the instrument mix, which we conceptualise as being only a part of the overarching policy mix. This calls for a distinction between instrument mix and policy mix, with the latter encompassing the former.

At the heart of the concept of instrument mixes are interactions between the instruments, which signify "that the influence of one policy instrument is modified by the co-existence of

[11] Di Stefano et al., Res. Policy, 41 (2012), pp. 1283-1295, 10.1016/J.RESPOL.2012.03.021
[12] S. Borras, C. Edquist, Technol. Forecast. Soc. Change, 80 (2013), pp. 1513-1522
[13] a) del Río González, P., 2009a. Interactions between climate and energy policies: thecase of Spain. Clim. Policy 9, 119–138.; b) Edler, J., Georghiou, L., 2007. Public procurement and innovation—resurrecting thedemand side. Res. Policy 36, 949–963; c) Sterner, T., 2000. Review of Policy Instruments, in: Sterner, T. (Ed.), PolicyInstruments for Environmental and Natural Resource Management. Resourcesfor the Future Press, Washington, DC, pp. 67–70.; d) Wieczorek, A.J., Hekkert, M.P., 2012. Systemic instruments for systemic innovationproblems: a framework for policy makers and innovation scholars. Sci. PublicPolicy 39, 74–87.

other"[14]. Clearly, these interdependencies of instruments largely influence the combined effect of the instrument mix and thus the achievement of policy objectives[15]. It is for this reason that interactions of policy instruments represent a central component of any policy mix concept.

Another aspect to be taken into account when designing instruments in the view of their interactions is the geographical dimension and the dynamic nature of those instruments. The geographic dimension constitutes the space from which the policy mix originates. The inclusion of this dimension is in line with the increasing attention to the geographical perspective in decarbonisation studies. For example, a regional policy strategy includes instruments targeted towards a certain geographical region[16], such as funding initiatives of specific cities or regions aiming at promoting green industrial clusters.

Finally, time is another crucial dimension in the policy mix concept, capturing its dynamic nature both in terms of its elements and processes.

Discussions during the meeting in Vienna highlighted the importance of a coordinated action addressing the ambition-level captured by the emission targets, the support-level captured by the magnitude of positive investments, and the flexibility-level capturing the extent to which policies will adapt to innovations.

4.2. Processes

The second building block refers to the policy making and policy implementation. Due to the inherently dynamic nature of technological changes and decarbonisation, the policy process needs to be flexible and adaptable to different political, economic, and societal conditions. The crucial feature of designing a process that takes the above-mentioned variables into consideration a is centred around a cycle of problem-solving attempts, which results in this very MLE and the stages/topics it aims to address. The outcomes of this MLE will result in recommendations that will inform the next phase of the policy process, namely implementation.

4.3. Characteristics

Both elements and processes can be described by their characteristics, defined as the consistency of each element listed above, the coherence of policy mix processes, as well as the credibility and comprehensiveness of a policy mix. **Consistency** refers to the state of a policy mix that is characterised, in its weak form, by the absence of contradictions and, in its strong form, by the existence of synergies within and between the elements of the policy mix, thereby enabling the achievement of policy objectives. **Coherence** refers to a synergistic and systematic policy making and implementation processes contributing – either directly or indirectly – towards the achievement of policy objectives. Such more synergistic and systematic policy processes may be achieved through several structural and procedural mechanisms, such as strategic planning, coordinating structures, and communication networks. **Credibility** of a policy mix refers to the extent to which the policy mix is believable and reliable,[17] both at an overall level, and at the level of its elements or processes.

[14] S. Borras and C. Edquist, Technological Forecasting and Social Change, 80, 8, 2013, 1513-1522
[15] Flanagan, K., Uyarra, E., Laranja, M., 2011. Reconceptualising the 'policy mix' for innovation. Res. Policy 40, 702–713.
[16] M. Navarro et al., S3 Working Paper Series n° 03/2014 – February 2014
[17] Newell, S.J., Goldsmith, R.E., 2001. Journal of Business Research, 52 (3), 235-247.

Discussions on the specificities of the policy characteristics go beyond the scope of this report and will not be addressed here.

5. Survey results

Prior to the meeting, a survey with nine questions was distributed to all participating countries. The results were used to structure, inform, and inspire the discussions during the Vienna meeting. Below, the results and the most important points raised during the discussion are summarised.

5.1. Update of the National Energy and Climate Plan (NECP) and new REPowerEU chapter

Most of the participating countries are in the process of updating their NECPs. Portugal highlighted that they are making an effort to increase the ambition of the final targets.

Another important aspect that we wanted to explore is the extent to which R&I investments were made or planned were to be made within the new NECP. In this regard, there is no mention of new measures, and despite being acknowledged that it is necessary to increase the percentage invested to meet the targets, , there is no concrete plan in place.

In reference to the specific question on the update of the plan in terms of the REPowerEU, most of the participating countries have submitted or are preparing the new chapter, with the exception of Finland, which is hampered in doing so due to the political transition to a new government.

5.2. Support for up-skilling to accelerate the uptake of technologies

There is a general awareness and acknowledgement of the fact that resources and efforts invested in up-skilling will accelerate the uptake of new low-carbon technologies. However, only four participating countries are actively moving towards specific plans to implement this activity. Belgium (Flanders) has already put in place training programmes for more mature technologies (such as heat pumps) and plans more training programmes as it recognises the transition is technology driven. Slovenia highlighted the importance of a collective effort that includes both government and institutions.

5.3. State-aid instruments and specific schemes supporting industrial decarbonisation

Most of the participating countries are aware of state aid instruments such as the recently revised General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework, that facilitates the deployment of public funds. Belgium (Wallonia) highlighted issues faced in budget capacity when aiming to distribute public funds along these lines. In terms of country specific state aid schemes, there is a significant gap between countries like Belgium, Austria, and Spain, and the remaining countries participating in terms of the number of schemes available for supporting industrial decarbonisation strategies.

5.4. Role of ex-ante conditions in setting priorities

We found there to be a gap in the understanding of the ex-ante conditions, however there are still a few participating countries (Finland, Portugal, Slovenia, and Türkiye) that have

considered (the role of) ex-ante conditions in developing the decarbonisation plan. These include the assessment of existing resources, the analysis of decarbonisation challenges and targets, stakeholder consultation, the assessment of emerging technologies, economic analysis and feasibility analysis.

5.5. Start-up and SME-targeted financing mechanisms

Several countries have few schemes in place to support SMEs, mostly in the form of different financial instruments. However, some countries have a diagnosis instrument in place (e.g. Belgium Wallonia) to support the development of their transition to low-carbon technologies.

On the support to SMEs, further discussions have highlighted the market power of large companies versus SMEs, which have developed technologies, but face difficulties in their implementation. Hence it remains important to have a good supporting system for SMEs in place (e.g., Spain). Companies, especially SMEs, are asking for stability and guidance on where to invest (e.g., Portugal).

5.6. Synergies between National and EC R&I programmes

Identifying synergies between National and European Commission initiatives has resulted in most of the participating countries listing the main EU programmes (i.e., Horizon Europe, Innovation Funds, European Innovation Council (EIC)). There is still a lack of comprehensive understanding of all possible synergies despite the general alignment of national and European Commission priorities.

5.7. Demonstrators and FOAK plants

Resulting from the survey, we conclude that there is a comprehensive list of demonstrators in several participating countries[18]. However, there is a need to make this list more visible in order to facilitate collaboration among countries and benchmarking. There is no mention of FOAK installation or plan for those.

The origin of funding for demonstrators was also raised as an issue. The funding to establish the demonstrators comes from various sources including Innovation Fund (Spain) or national sources via competitive clusters and collaborative projects (Belgium Flanders and Wallonia). Most demonstrators are energy-driven, which raises the point of producing green energy to decarbonise industry (Portugal using offshore plants, Lithuania moving from gas to hydrogen for fertilizers' producers). This point is also linked to carbon and energy prices, which affects the implementation of technologies as well as the decarbonisation decisions of companies.

[18] The list discussed here refers to the Survey's response. For a complete list published by the European Commission see 'Scaling up innovative technologies for climate neutrality' May 2023. https://op.europa.eu/en/publication-detail/-/publication/2f1ec1d2-1173-11ee-b12e-01aa75ed71a1

6. Country presentations

The following presents a short synthesis of the country presentations during the Vienna workshop.

6.1. Austria

The roadmaps of Austria are based on a target to make Austria climate neutral by 2040 and are inspired by the need to initiate the transformation at present due to the nature of long investment cycles. The high Operating Expenditure (OPEX) and Capital Expenditure (CAPEX) costs of infrastructure underpin the need for early planning and reliability. This requires as a prerequisite flexible funding instruments, the avoidance of over-funding, and the guarantee of long-term planning to foster investment decisions.

6.2. Georgia

Contrary to the EU Member States, Georgia still has a young and strongly growing economy, which has resulted in an increase in greenhouse gas (GHG) emissions amounting to 90% since 2015. In spite of this, Georgia has agreed on an NECP with the European Commission. It is based on voluntary energy consumption savings by the EIIs, to be followed by the less energy intensive industries with dedicated incentives.

6.3. Spain

Spain has set up General guidelines for a New Industrial Policy 2030 whereby priority nine is about sustainability, referring mainly decarbonisation and circular economy. The NECP has been updated. Significant points of attention include the framework for aid schemes (Industrial Decarbonisation Strategic Projects for Economic Recovery and Transformation (PERTE)) and the methodology used for designing such a framework.

6.4. Portugal

In Portugal, 59% of electricity is already generated on a renewable basis (26% wind, 23% hydro, 7% biomass and 3.5 % photovoltaic). A target of 80% is set for 2026. The EIIs in Portugal use 23% of the electricity and 30% of the gas. Portugal presented the implementation of its National Strategy for Industrial Decarbonisation until 2030 via the NECP. It is further supported by a Hydrogen roadmap and action plan.

7. Discussion with industry and follow-up

The afternoon session included a discussion with an industry panel from Austria, which included two representatives, namely Christian Bugl, Head of Environment, Health & Safety at TAKEDA Pharma (pharmaceutical industry), and Joseph Kitzweger, Director of Sustainable Development at Holcim (cement industry). Both representatives presented several initiatives and projects implemented in their own industries that contribute to addressing the decarbonisation of their industries.

In the cement industry, the project presented concerns the capture of CO2, which relies on the Innovation Fund to build a demonstrator. The captured CO2 will also be used in the refinery of plastic, hence there is an industrial symbiosis aspect.

The pharmaceutical industry is still working on understanding the needs of the sector. They are preparing a roadmap to include the low-carbon technologies by focusing on optimisation, framework conditions and infrastructures. This effort should also serve to help smaller companies with less capacity. This initiative is co-funded together with other pharmaceutical companies[19].

Some important points raised during the panel discussion included:

- Risks and barriers: financial risks associated with the amount of investment needed for the EII; lack of regulation; insufficient funding in Europe (compared to the new Inflation Reduction Act (IRA) in the US); lack of energy supply and infrastructure; low availability of hydrogen; lack of ecosystems among industries for energy transfer and energy use (i.e., circular economy).

- Industrial symbiosis and sectoral coupling (e.g., using waste heat through the collaboration between the manufacturing sector and energy sector) is not an approach being explored much and needs to be encouraged.

- In low-temperature processes (i.e., drying, granulation, etc.) typically employed in pharmaceutical and textile industries, there are some current solutions, such as heat pumps, that do not require significant amounts of investment and can be applied immediately to optimise and provide benefits in terms of energy savings.

[19] https://www.takeda.com/de-at/newsroom/2023/takeda-unveils-first-industrial-application-of-natural-gas-free-steam-generation-in-pharmaceutical-industry/; https://science.apa.at/power-search/11971571686499203492

CONCLUSION

The purpose of the second meeting in the context of the MLE on Industrial Decarbonisation, held on 29-30 June 2023 in Vienna, was to:

- discuss different approaches to innovation policy and financing,
- examine how governments and public agencies in different participating countries have used these instruments,
- explore the instrument choice and design (and associated issues), and
- elaborate a set of possible recommendations/directions or benchmarking for the design of the instruments in relation to the formulation of innovation policy-mix.

During the open discussion, it became evident that **instruments for the policy-mix** are selected by means of an ad-hoc set of decisions determined by national roadmaps, largely based on a continuation of previous schemes, or as a result of lobbying activities of specific industry groups, rather than on a holistic innovation policy that would integrate all public actions that may influence decarbonisation. Policy instruments on their own are not systemic unless combined into a policy mix that addresses the complex and often multi-dimensioned nature of innovation. In this regard, several factors that can hamper transition are identified and should be considered in the MLE, including:

i. the risk associated with the deployment of some technologies, such as hydrogen and at the same time, of being the first mover;
ii. the long investment cycles of companies;
iii. the different pace of processes, e.g., when technologies are already available but cannot be implemented due to a lack of regulation;
iv. the price of electricity vs. gas.

Differences among the European economies make it difficult to compare across countries. In addition, **different industries need different approaches**. These differences raise the importance of having visible demonstrators across Europe for each industry. In some industries, a small change in the process, without the use of disruptive technologies, is enough to have a strong impact (e.g., Spain and Lithuania).

Although, all participating countries have industrial technology roadmaps and most of them also have sector-specific strategies, not all of them have comprehensive programmes promoting R&D industrial transformation.

There seems to be a lack of connection between research policies and innovation policies, as these are often developed in isolation. In addition, a lack of links to European partnerships has been noted. The connection between Member States' delegates and the EU partnership representative needs to be formalised and the engagement will need to be more structured to facilitate communication and exchange.

In conclusion, achieving industrial decarbonisation requires a long-term vision (roadmap) and a diverse and coordinated mix of policy instruments implementing it. An approach that combines carbon taxation and innovation support, based on a proportionate combination of demand-pull and technology-push factors (in favour of demand-pull), is necessary to overcome implementation barriers. In addition, policies that facilitate the provision of the necessary infrastructure, while preserving business dynamism are required to enable both industrial firms' decarbonisation investments and ensure economic growth and competitiveness.

R&I measures are still competing with other priorities and are decided on the basis of continuing existing schemes or setting up individual schemes. There is no systematic orientation towards the bigger picture of industrial decarbonisation and climate neutrality. Priorities are aligned, yet they remain fragmented. There is no comprehensive approach to deal with this. Rather, a whole-of-government approach is needed, which, through the institutional set up, takes control of comprehensive design and implementation of R&I programmes and investments to support high policy intentions.

THE WAY FORWARD TO ACHIEVE IMPACT

Several areas were identified which would require further open discussion in subsequent meetings in order to inform the final recommendations of this MLE.

- **Cooperation between EU and national projects**. A lack of well-structured links and cooperation have been identified between EU and national projects. The need to increase visibility and collaboration through a specific platform of communication is necessary in view of integrating solutions and innovations across industries.

- **Best practice on the choice of instruments**. There are several approaches taken across the Member States for the choice of policy mix, employing different mechanisms addressing different intermediary objectives. Understanding that the policy mix, as a whole, is more than the sum of its instruments, it is necessary to ensure the efficiency and consistency of the portfolio of policy instruments. Best practices aimed at achieving high-TRL demonstrators and first-of-a-kind installations (FOAKs)across the Member States should be identified and showcased to enable consistencies while at the same time taking the regional and local context into account.

- **The role of SMEs**. Several countries mentioned their activities for SMEs. The role of SMEs in the EII industrial ecosystem is missed. SMEs can play strong intermediate role in the circular economy approach. To be more inclusive towards SMEs with respect to financial instruments as a support for the de-risking of innovation, stronger engagement with industry associations rather than a single organisation/company would be beneficial.

- **Improving links with the European partnerships**. It is observed that most of the national roadmaps are made without consulting the roadmaps of Processes4Planet, Clean Steel, Made in Europe, etc. In order to facilitate links and communication with European Partnerships, an Ambassadors Group has been established in the P4P partnership, composed by members of P4P, with the objective of acting as a point of contact between the Member States' delegates and the European Partnerships. More communication initiatives are advised to make the communication process more efficient.

- **Trust, transparency, and representativeness in public-private partnerships**. Involvement of all the stakeholders, participating in the decarbonisation transition, is essential and should be stimulated by an inclusive and comprehensive representation within the European Partnerships. Encouragement of the participation of smaller players will favour a trustworthy and transparent process that will enable the effectiveness of the final objectives.

- **Collaboration among countries**. Collaboration among countries is mentioned to be very important for smaller countries or regions (e.g., Wallonia in Belgium in view of state aid rules).

- **Academia and citizen engagement**. The involvement of academia and research organisations has been acknowledged to be crucial, in both, the development of policies and in accelerating the implementation of innovative technologies, and, as such, requires more attention. The importance of engaging citizens in the transition to decarbonisation may also be an area that deserves to be explored more.

Annex I: Survey questions

In order to capture more insights on the national strategy/industrial technology roadmap design, financing mechanisms, and mobilisation of R&I investments, a survey has been circulated to the MLE participating countries. The replies were discussed during the 2nd MLE meeting, held on 29th-30th of June 2023 in Vienna and are incorporated in the findings in this report. Below, we present each country's specific answers to the survey questions.

AUSTRIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
Yes – consultations with the Commission are ongoing.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?
The NECP of Austria is currently still in coordination within the Federal Ministry for Climate Action and will then enter public consultations. R&I investments are being addressed, the precise targets and means to achieve them are outstanding.	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Yes, the regulation is known and GBER is already being implemented in Austria, particularly in terms of public calls for tenders.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

There are several, including "Transformation der Wirtschaft", "Transformation der Industrie", the "Frontrunner Initiative", as well as broader and more general support schemes. In addition, Austria employs aid schemes, which particularly concern R&I, developments, such as the "Technologieschwerpunkte". These aid schemes aim at supporting the emergence of new technologies and industrial processes. These elements will be addressed in more detail during the Austrian presentation at the ERA 12 MLE on the 29th & 30th June, hosted in Vienna.

Additionally, Austria is actively engaged in IPCEIs and gives certain tax incentives for research.

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?

Oftentimes R&I investments are aligned with needs from stakeholders. Therefore, institutions such as the Chamber of Commerce and the Federation of Austrian Industries engage in data collection and conduct relevant studies.

Additionally, the main streams of R&I funded by the Federal Ministry for Climate Action (Energy Transition, Mobility Transition, Circular Economies, and Climate-neutral Cities) have dedicated Impact and Evaluation plans to ascertain needs ex-ante, as well as measure cause and effect in the short, medium, and long-term.

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

Austria is member of Eureka and supports international cooperation projects based on experimental research and development (TRL5 -7) through a specific national funding scheme (Basisprogramme) covering up to 60% of the project costs for SMEs. In addition to open bottom-up programmes, Eureka also support projects managed by industry led consortia with specific roadmaps. Two of these consortia focus on energy and low cardon technologies:

- EUROGIA2030 (energy)
- Metallurgy Europe (Metallurgy)

Austria supports the scaling up of deep tech start up including with GreenTech solutions with a dedicated programme "aws Seedfinancing". The programme also links to the European Innovation Council (EIC) by providing the possibility of a Plug-In scheme for successful projects (direct access to step 2). The Plug-in is also possible for start-ups or SMEs supported by Austria's Basisprogramme.

Austria supports the scaling up of start-ups and SMEs by providing patient capital as co-investor through the newly created "aws Gründungsfonds II" (72 Mio € of capital).

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
There are several potential synergies between national and European R&I programmes for low-carbon technologies. The most obvious ones concern individual or collaborative funding at national level and collaborative research in Horizon Europe. By supporting large international collaborative consortium projects, Horizon Europe and especially some of the partnerships (for instance Clean Steal or P4P) can support more ambitious projects based on a wider range of complementary expertise. Another complementary instrument is the Innovation Fund. Pilot and demonstrators in relation with the green transition are typically capital intensive and require adequate resources (often over 10 Mio €). With its European dimension the Innovation Fund concentrates resources and provides the necessary support for large scale calls that can be missing at national level.	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
Yes, for example EVN Green the Flex, a project funded through the European Innovation Fund, as well as some IPCEI projects, particularly in the Hydrogen IPCEIs. A lot of projects are currently being planned in the context of the Transformations of Industry and Economy (see Question 5). In a previous call under the Transformation of Economy, three successful projects explicitly addressed the transition to renewable energies. Additionally, of course, there are the eight technology demonstrators of Austria, as determined by the study of the EU Commission and its experts.	

Box 1. Answers to survey questions (Austria)

BELGIUM (Flanders)

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
Yes. A first draft of the REPowerEU-chapter for Belgium was submitted to the EC at the end of May 2023. Discussions are currently ongoing with the EC to further refine the measures in the RePowerEU chapter with the intention of formally submitting an amended RRF plan for Belgium in the near future.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

Flanders has a regional climate and energy plan (VEKP), which is integrated into the Belgian National Climate and Energy Plan (NCEP). A new version of both plans is being prepared.

Reference: Ontwerp Vlaams Energie en Klimaatplan van 12 mei 2023. https://assets.vlaanderen.be/image/upload/v1683894247/Vlaams_Energie-_en_Klimaatplan_actualisatie_12_mei_2023_tpletf.pdf

Chapter 7 of the VEKP ("DEEL VII: Onderzoek, innovatie en concurrentievermogen") deals with research, innovation and competitiveness.

7.1.1 Strengthen energy and climate research and development
- 7.1.1.1 Stimulating research and development (R&D) in the field of energy and climate via the regular R&D instruments;
  FWO, VLAIO instruments and calls: ongoing business, continuation of the efforts
- 7.1.1.2 Structural funding of strategic research through the Strategic Research Centers (SOCs);
  VITO, IMEC, Flanders Make: continuation of the efforts.
- 7.1.1.3 The Cluster Policy: continuation of the efforts.

7.1.2 Research and innovation aimed at Flemish industry carbon circular and low CO_2 by 2050
- 7.1.2.1 Transition framework for the transition to a low-carbon industry
  Flemish Moonshot program: R&D low carbon industry: continuation
  Transition program Klimaatsprong: program to facilitate the transition to zero carbon energy intensive industries. Started up 2022.

7.1.3 More intensively encourage demonstration of low-CO_2 technologies
- 7.1.3.1 Extension of the support process within the regular set of instruments (demo, pilot, trial) Starts up 2023.
- 7.1.3.2 Demonstration more intensive stimulation of low-CO_2 technologies via ERDF/Interreg
- 7.1.3.3 Optimal use of the European Innovation Fund

7.1.4 Accelerate the roll-out of innovative low-CO_2 technologies in Flanders: continued effort.

7.1.5 Flemish opportunities CCU/CCS and hydrogen: continued effort

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

Education and training is not a separate chapter of the VEKP, but the subject is an integral part of some of the specific actions planned.

- Specifically, the program Klimaatsprong will try to facilitate the energy and climate transition in the energy intensive industries, on the long term. A program note is approved every legislature. This legislature technologies, support programs and infrastructure are in focus. It is expected that afterwards, in the next legislatures, as soon as the first choices are made, education and training for installing and using the selected technologies will be one of the focus points.

- In other cases, like direct electrification, where technologies in focus are more mature, initiatives are already being taken, like training for installers of heat pumps.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Flanders closely follows the evolution of state-aid instruments like the General Block Exemption Regulation and the Guidelines on State aid for climate, environmental protection and energy.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?
Flanders is using the General Block Exemption Regulation for the R&I support in general and for the Moonshot specifically.	

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
-	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
Flanders started a program called GREEN in 2023, with a main focus on direct electrification of heat in the industry, the main focus is on non ETS. Startups and SMEs are in focus.	

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
The Flemish investment programmes for low carbon technologies are based on the GBER and have a lot of shared goals and have some comparable selection criteria with the ETS IF. Of course, the budget for the Flemish investment programmes is a couple of dimensions smaller. So far Flanders has only subsidised CAPEX, but it investigates schemes to also support OPEX.	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

- ArcelorMittal Belgium: support for the Direct Reduction of Iron. Investment Decision expected.
- BASF/Air Liquide: Kairos@C: CCS project funded by ETS IF
- Antwerp@C: CCS backbone: funded by CEF

Box 2. Answers to survey questions (Belgium - Flanders)

BELGIUM (Wallonia)

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?

Yes. A first draft of the REPowerEU-chapter for Belgium was submitted to the EC at the end of May 2023. Discussions are currently ongoing with the EC to further refine the measures in the RePowerEU chapter with the intention of formally submitting an amended RRF plan for Belgium in the near future.

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

A Regional Air-Climate-Energy Plan was adopted by the Government on the 21 of March 2023, it constitutes the regional contribution to the National Plan Energy-Climate. It contains objectives by sectors (non ETS), and a set of policy measures.

https://awac.be/wp-content/uploads/2023/03/PACE-2030_adopte-GW-21-mars-2023.pdf

For decarbonisation of industry, the strategy capitalises on existing strategies - Circular Wallonia, Smart specialisation strategy - and policies – eg. Cluster policies. In particular for R&I, the S3 roadmap for our strategic innovation priority 'Sustainable energy systems and buildings' is the reference.

(https://s3.wallonie.be/home/domaines-dinnovation-strategiques/dis4-systemes-energetiques-et-habitats-durables.html).

Some data about R&I investments are available in the annex of the Air climate Energy plan and in the ppt in annex.

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

Yes, the Air climate Energy plan encompasses measures about training and skills.
Also, our S3 and circular strategy tackle that dimension, making the link between expected development in innovation / circular economy and the need for new competencies / equipping workforce with new skills.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?

Yes, we are aware of it – but I don't think it is already used in Wallonia. A strong bottleneck is budget capacity.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

Yes, we have several schemes

- For the ETS sector, we have 'branch agreements' were energy intensive sectors take formal engagement for reducing their emissions and improving their energy efficiency against specifi support from the regional authorities - Les accords de branche 2014-2020-2023 - Site énergie du Service public de Wallonie
- Investment aid: Demander une prime à l'investissement en faveur de l'utilisation durable de l'énergie et de la protection de l'environnement (wallonie.be)
- Investment Aid cofounded with the ERDF has specific criteria linked to decarbonation: Demander une prime à l'investissement cofinancée par le FEDER 2021-2027 (wallonie.be)
- Walenergy is a scheme combining adise and funding to companies for their decarbonation: https://www.1890.be/solution/walenergie/, https://clusters.wallonie.be/tweed/fr/news/walenergie-un-accompagnement-cle-sur-porte-pour-aider-les-entreprises-dans-leur-transition
- IPCEI support (Hydrogen) – see below
- Call in our recovery plan/RRF (through our Competitive clusters): https://www.wallonie.be/fr/plans-wallons/plan-de-relance-de-la-wallonie/projets/soutenir-la-decarbonation-des-entreprises-0 - Results : https://borsus.wallonie.be/home/communiques-de-presse/communiques-de-presse/presses/presse-4.html
- We fund a specific programme on decarbonisation of the aeronautic sector: https://www.wingspartnership.be/index-en

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?

In the context of our S3, we have selected several Strategic Innovation Initiatives, which are consortium of stakeholders associated around an action plan, aiming at reaching specific ambitions set in our S3. We have notably selected in relation to our energy priority:
the CONTRIBUTE initiative aiming at decarbonisation of mobility and the energy system (https://s3.wallonie.be/home/domaines-dinnovation-strategiques/dis4-systemes-energetiques-et-habitats-durables/les-iis-du-dis-4/contribute.html)
the eWallonHY dedicated to green hydrogen (https://s3.wallonie.be/home/domaines-dinnovation-strategiques/dis4-systemes-energetiques-et-habitats-durables/les-iis-du-dis-4/e-wallonhy.html)
the CETWA initiative aimed at developing energy communities (https://s3.wallonie.be/home/domaines-dinnovation-strategiques/dis4-systemes-energetiques-et-habitats-durables/les-iis-du-dis-4/cetwa.html)
The RENOWinitiative aimed at massification of building renovation (https://s3.wallonie.be/home/domaines-dinnovation-strategiques/dis4-systemes-energetiques-et-habitats-durables/les-iis-du-dis-4/renovation.html)

In the context of our S3 we notably aim at optimising the existing policy mix rather than creating new tools – so those initiatives are developing an action plan and will use at best the existing policy instruments, even if they are not targeted to specific topics.

Some calls are specifically dedicated to our S3 priorities.
For example the Win2Wal funding industrial research projects was notably dedicated to our Staretgic innovation domain on energy (https://recherche.wallonie.be/win2wal). The call dedicated to excellent research in universities are also geared toward S3 priorities Win4Excellence - La Recherche en Wallonie

We have also launched a new S3 call to support close to the market innovation projects (TRL 6+) specifically dedicated to our Strategic Innovation Initiatives (https://s3.wallonie.be/home/appels/appelprw--pilier-3-coodeviis---projets-innovants-collaboratifs-de-developpement-experimental-pour-les-iis.html)

A new call has recently been launched about CO_2 management: 0Carbon4Wal : Appel à projet de recherche - Awac - Agence wallonne de lair et du climat

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

- the easy green scheme is specifically dedicated to SMEs: https://www.1890.be/solution/financement-easygreen/?search&terms=easygreen
- within the ERDF programme, we have a scheme to help SMEs to have a diagnosis and support them in developing their low carbon transition

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

In the context of our S3, we are promoting synergies with EU policies and programmes. We have dedicated a budget to support our Strategic Innovation initiatives to develop a EU strategy, get involved in relevant networks and initiatives,…(https://s3.wallonie.be/home/appels/appelprw--pilier-1-gestion-de-liis-et-redaction-de-projets-europeens.html). In addition we have a dedicated budget to cofound the participation of our regional stakeholders in EU projects (https://s3.wallonie.be/home/appels/appelprw--pilier-2-soutien-aux-projets-europeens-et-dinternationalisation-des-iis.html).

- We are cofunding the HE Clean Energy Transition Partnership https://energie.wallonie.be/fr/12-06-2023-appel-clean-energy-transition-partnership.html?IDD=170151&IDC=8187

- The region also support IPCEI projects, notably on hydrogen (in the context of RRF - https://borsus.wallonie.be/home/communiques-de-presse/communiques-de-presse/presses/le-gouvernement-wallon-donne-un-coup-daccelerateur-au-developpement-dune-filiere-hydrogene-en-wallonie-avec-deux-projets-uniques.html)

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

Yes, we have ongoing projects (cf above):

- https://borsus.wallonie.be/home/communiques-de-presse/communiques-de-presse/presses/presse-4.html
- We fund a specific programme on decarbonisation of the aeronautic sector: https://www.wingspartnership.be/index-en

Box 3. Answers to survey questions (Belgium - Wallonia)

SPAIN

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?

Spain is in the final stages of the preparation of the new REPowerEU chapter of the RRP. The addendum has been approved by the Spanish government and officially sent to the European Commission for its approval.

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

-

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
-	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Yes, we have analysed both instruments. Actually, our industrial decarbonisation aid scheme will be based on the revised GBER.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

PERTE Descarbonización Industrial is a strategic programme of the Spanish Ministry of Industry funded by the RRP that includes four aid schemes:

1. A general aid scheme for the decarbonisation of industrial processes, requiring a reduction of at least 3.000 tCO_2e per framework project (or 30% reduction of initial emissions).
2. Ad hoc grants for projects derived from the green hydrogen IPCEI (e.g. ArcelorMittal Asturias DRI).
3. A feasibility study for a CCfD to support industrial decarbonisation projects with high and/or uncertain variable costs.
4. An aid scheme for zero-emission greenfield industrial installations manufacturing products currently included in the EU ETS.

The Ministry for the Ecological Transition and IDAE (an agency that supports energy efficiency and renewable energy projects) have aid schemes that support industrial decarbonisation projects more or less directly:

- PERTE Circular Economy.
- PERTE Renewable Energy, Hydrogen and Energy Storage.
- An aid scheme to support renewable electricity and thermal energy generation power plants that substitute CHP plants running with fossil fuels.
- An aid scheme to support greenfield projects for the manufacturing of net-zero machinery and technology, i.e. heat pumps, equipment for renewable electricity generation, hydrogen electrolysers.

CDTI (agency for innovation in industry technologies) has a programmed called “Science and Innovation Missions” (“*Misiones Ciencia e Innovación*”), that includes grants for innovation projects for industrial decarbonisation. One of its targets is “fostering the ecological transition”.

Finally, some Spanish autonomous regions (Comunidades Autónomas) that comprise Just Transition areas have dedicated aid schemes for ETS industrial installations in their aid schemes based on the Just Transition Fund.

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
-	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
-	

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
We are aware of the EU Innovation Fund and its synergies with national programmes.	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
We have looked at several projects that will come in the next years, but we are not aware of any project of this kind that has already been implemented.	

Box 4. Answers to survey questions (Spain)

FINLAND

Update of the REPowerEU chapter.	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
Not that I know – we are just getting new Government, so things are not clear yet.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?
NECP will be send by 30/6. R&I investments in new Government program: under study, but more less none.	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
All technologies are now low/zero-carbon. Whether there are brand new or just upgrades from existing low-carbon technologies is just fine line drawn in the water.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Yes, we are aware.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?
No aware.	

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
The setting priorities is of course affected by presents (ex-ante) and the coming boundary conditions, settings etc.	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
Not that SME-specific. Of course, start-ups/SME get special attention, but no special mechanism.	

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
Of course, there are synergies, but yet the 27 member states have different conditions etc. The problem with EC programmes is that as they try to fit of all 27, there are either too general or then too much big MS-oriented, not fit for smaller, northern MS. Also, the timing (we just had general election, the power and orientation was changed from left to right) is a challenge.	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
Sorry, no examples for this time.	

Box 5. Answers to survey questions (Finland)

GEORGIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
This is not applicable to Georgia yet. The information below provides description of research and innovations sector, including key strategic frameworks that are approved or in the pipeline, as well as ongoing key initiatives and programmes on the subject. Relevant national legal framework of Georgia: • 2021: Strategy of Climate Change of Georgia – „Georgia 2030“ and Action Plan 2021-2023 • 2022: Resolution of the Government of Georgia №409 „Technical regulations for the management of waste oils“ A. plan has been drawn up until 2032 with target indicators of waste oil recovery and regeneration by year. • „Strategy of Green growth of Georgia” (to be developed) • „Integrated National Energy and Climate Plan of Georgia“(finalised) A. The document is created with cooperation of the Ministry of Economy and Sustainable Development of Georgia and the Ministry of Environmental Protection and Agriculture of Georgia • 2021: Resolution of the Government of Georgia №428 “Health Rules of Non-Food Products of Animal Origin (including Waste of Animal Origin) and By-products, which are not Intended for Human Consumption, and Rules for Recognition of Business Operators Working with the Same.” • In 2019 Law on promoting the generation and consumption of energy from renewable sources was approved. • In 2020: “Law on promoting the generation and consumption of energy from renewable sources". The final draft of amendments to the Law of Georgia promoting the generation and consumption of energy from renewable sources and related Secondary Legislation has been developed.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

Since Georgia is member of Energy Community (EnC) it has a deadline to submit its first ever draft of NECP to the EnC Secretariat by 30th of June 2023, and adopt it by 30th of June 2024. Georgia has finalised its first NECP and now it has completed Strategic Environmental Assessment (SEA) in accordance to Georgian legislation which is in line with EU Directives.
Speaking of R&I investments in EII, this is first time ever this topic is being discussed and dimension of Research, Innovation and Competitiveness was one of the hardest to prepare from scratch.
For example, of the measure in the RIC dimension covers promotion of innovation in business and stimulate private investments in R&I. Namely, this measure will support Research2Business fellowship programs in the field of sustainable development. Within the program PhD students and early-stage researchers can pursue/tailor their research in the specific industry (Private companies operating in the Energy and Climate fields). This will help to both increase applicability and relevance of research results as well as increase private investments in RDI. Besides that, there is measure on Support and strengthening of RDI related to sustainable energy.

The law on promoting the generation and consumption of energy from renewable sources, defines national targets for the share of the energy produced from renewable sources from the energy consumed by the transport, electricity supply by 2030.

- Parliament has begun working on climate change legislation and to that end has produced a “Green Book” on Climate Change legislation, which was put out for public consultation this spring.
- In order to encourage investments in the field decarbonisation, government continues to develop a legislative framework for the use of renewable energy sources and the introduction of technologies that will reduce greenhouse emissions. In the updated Nationally Determined Contribution (NDC), Georgia made an unconditional commitment to reduce greenhouse emissions by 35% by 2030 under the Business as usual (BAU) scenario. In the case of international aid, a conditional commitment to increase it to 55-57%.
- December 2022, 32 municipalities have signed the Covenant of Mayors, committing to develop Sustainable Climate and Energy Action Plans (SECAPs). SECAPs include GHG emission reduction targets for municipalities, as well as actions aimed at reducing energy demand and increasing energy efficiency in the period up to 2030.

Goals:

- Goal 1: reduction of greenhouse gas emissions (by 2030, a target rate of 35% of the total local emission of greenhouse gas compared to the rate of 1990.)
  The sub-goals include the following:
- Goal 1.1: reduction of emissions from production processes and product consumption (IPPU) by 5% compared to the control level;
- Goal 1.2: Reduce emissions from agricultural production and support low-carbon approaches in the agricultural sector;
- Goal 1.3: Increase carbon sequestration by 10% in land use, land use change and forestry (LULUCF);
- Goal 1.4: Promote low-carbon development of the waste sector by promoting climate-smart and energy-efficient technologies and services**.**

Another renewable energy sub-goal, 1.5 is included in section 2.1.2.

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

- Goal 1.5: Increase the share of energy from renewable energy sources in total energy consumption (target 27.4% by 2030).

Georgia's ultimate goals related to renewable energy are as follows:

- Objective 1.5:

- The share of renewable energies in the total energy balance by 2030 is represented by 27.4%.

The introduction of new technologies is considered to be the main driver of efforts towards low emissions. Technological upgrading is urgently needed in many other areas of the economy as well. Georgia plans to replace outdated technologies with more efficient new technologies imported from other countries. The government is working on the initiative: from 2024 only Euro-5 cars will be registered in Georgia. From the point of view of decarbonisation, the promotion of energy efficiency and renewable energy will be one of the main directions by 2050.

In the generation of renewable energy, hydro resources are the traditional type in Georgia, and these resources dominate the generation of electricity. However, Georgia plans to diversify its own renewable sources by actively including solar and wind energy, as well as biomass in the structure of energy generation. Modelling within the NECP envisages the construction of new solar and wind power plants in parallel with hydropower plants, which will increase electricity production from renewable energy sources by almost 60%, and new plants built in the following decades will lead to an additional 60% increase. By 2050, solar power is expected to account for 13% of total installed capacity, wind power for 15%, and hydropower for 55%. Georgia also possesses other renewable energy sources, such as geothermal energy, however, the use of these sources is relatively limited.

As for decarbonisation and absorbers, several important measures are planned or in the process of implementation for the three sectors mentioned below:

- Measures aimed at the agricultural sector to reduce emissions caused by soil and livestock. This includes, firstly, a cost-benefit analysis (CBA) prior to the implementation of the measures;

- Forest management measures aimed at reducing the net emission of greenhouse gases. Includes afforestation efforts and implementation of improved management codes in the forestry sector. Also, in accordance with the demand, to improve the efficiency of wood stoves (see the sub-chapter on energy efficiency).

- Waste management and waste-to-energy measures aimed at reducing the amount of waste (especially organic) disposed of in landfills and collecting/utilizing methane gas at existing landfills.

33 specific events and investment offers are planned for the following years

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

Laws on RE and EE of Georgia stipulate that there should be qualified and certified RE technology installers as well as energy auditors, energy managers. At this stage there are already 34 certified RE technology installers.

Additionally, annually, state funds bachelor's programs in energy and electrical engineering; Environmental engineering and applied ecology; service and examination of vehicles; Legal Entity of Public Law - Environmental Information and Education Centre under the Ministry of Environmental Protection and Agriculture of Georgia was established on May 14, 2013. The main priority of EIEC is to achieve the following goals:

- Promote environmental and agricultural education among Georgian society and raise public awareness
- Support public participation in decision-making process
- Ensure access to the environmental and agricultural information
- Introduce and implement integrated information technology policy of MEPA

Activities carried out by EIEC are based on: The principles of the United Nations Economic Commission for Europe (UNECE) Convention on "Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters" (Aarhus Convention) and the visions and directions of UNECE Strategy for Education for Sustainable Development.

EIEC promotes sustainable development through encouraging education related to environmental components and by accessing comprehensive information.

The organization has approved the 2022-2026 action plan "Ensuring a clean and safe environment for human health and natural ecosystems and sustainable consumption of natural resources taking into account the interests of future generations":

In the framework of the program "Environmental and agricultural education at school", primary level teacher training continued throughout the country and more than 2000 teachers were trained. The process was renewed this year due to the demand.

In order to promote scarce environmental professions, the "Green Scholarships" program was introduced, and scholarships (1500 GEL) were awarded to 32 outstanding master's students.

To promote environmental and agrarian education, in 2022, up to 7,000 persons were trained across the country. Up to 5,000 persons were trained in environmental protection, and 1,300 farmers were trained to increase the quality of local agricultural products and raise the qualifications of farmers.

Also, professional training/retraining programs in agriculture for adults have been developed and were granted the right to be implemented.

The process will start this year.

The Ministry of Education and Science of Georgia approved the unified national strategy of education and science of Georgia for 2022-2030 and the action plan for 2022-2024. The Georgian Innovation and Technology Agency (GITA) (under the supervision of the Ministry of Education and Science) supports innovative projects through a number of programs, including co-financing grants and innovation small co-financing grant programs. Currently, information on funding from the state budget is generally available only for research and development (R&D) and is not broken

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

down by specific sectors (for example, the energy sector). There is also a state program "Produce in Georgia" that supports local production in various sectors.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?

To our knowledge, this is not applicable to Georgia

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

SRNSFG administers and will implement total in 2023 year, more than 26 national and international funding schemes (grant calls, targeted programs and joint projects) out of which 16 is announced and administered annually, whereas 10 is administered within the certain intervals. Among them are the grant calls for basic research as well as grant calls for applied research.

Another important initiative is:

ENTERPRISE GEORGIA – BUSINESS
As part of the Produce in Georgia program, the Business division promotes and supports the development of new enterprise as well as the expansion of existing operations by providing financial assistance to the entrepreneurial community. Some of the primary guidelines and conditions that apply to this assistance include:

General Conditions

- When launching a new enterprise, beneficiaries are required to start production within 24 months from the date of disbursement of the loan or signed lease agreement. For operators expanding an existing business entity, they must start production within 12 months after disbursement of the loan or signed lease agreement.
- Beneficiaries have access to co-financing of the interest accrued on the loan or lease issued by a commercial bank or leasing company during the first 24 months.
- Beneficiaries can obtain a collateral guarantee, up to 50% of the loan amount, for the first 48 months (no more than 2,500,000 GEL)

Requirements
Qualified beneficiaries must:

- direct at least 80% of the loan to the principal and capital expenditures. No more than 20% of the loan should be used for working capital.
- provide an operational profile that details the production direction (primary goods and/or services) of the enterprise.

Consulting Services

For beneficiaries seeking technical support linked to business development, the program provides access to:

- co-financing the cost of trainings associated with marketing, sales, business planning, and export development
- technical support linked to the identification, understanding and implementation of innovative and state-of-the-art technologies

Production Directions

There are a number of production directions (primary goods and/or services) that are supported by the Produce in Georgia program, as follows:

HOTEL INDUSTRY - REGIONAL DEVELOPMENT

Entrepreneurs engaged in the development of hotel properties in regional markets throughout Georgia have access to:

- co-financing of Franchise/Management agreements for the first 2 years (up to GEL 300,000 annually)
- co-financing of loans issued by a commercial bank for the first 24 months
- collateral guarantees up to 50% of the loan (No more than 250,000 GEL)
- co-financing of consulting services

Requirements

- Beneficiaries must direct at least 80% of the loan to the principal and capital expenditures.
- The hotel must be located within Georgia, excluding Tbilisi and Batumi.

Consulting Services

For beneficiaries seeking technical support linked to the regional development of hotel properties, the program provides access to:

- co-financing the cost of trainings associated with marketing, sales, and business planning.
- technical support linked to the identification, understanding and implementation of innovative and state-of-the-art technologies associated with hotel operations.

OTHER CATEGORIES

Other production directions that are eligible for support from Produce in Georgia include:

- Building Materials
- Mechanical Engineering
- Rubber & Plastics
- Paper and Paperboard
- Textile Production
- Pharmaceuticals
- Wood Processing
- Electrical Equipment
- Food Products
- Metal Products
- Mineral Water
- Mineral Products
- Chemical Manufacturing
- Bitumen Products

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
In most of the cases it is based on the expected contributions to the climate change mitigation, promotion of clean energy technologies and increasing energy security.	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

Shota Rustaveli National Science Foundation of Georgia (SRNSFG) operating under the auspices of the MoES is empowered to promote Georgia's integration into the international STI system, and significantly contribute to rapid socio-economic development and welfare of the country.
SRNSFG does not fund SME enterprises. Nevertheless, a new grant call "Innovation Voucher" will be launched in 2024. The latter's design stimulates establishing the collaboration with business partners. The call will be adapted for bringing together research institutions and enterprises. As the result of this cooperation, research institutions will be funded, and enterprises will receive knowledge and technology from these institutions. It should be noted, the project will synergistically consist of representatives from research institutions and SME. The method by which decarbonisation can be prioritized is still under discussion. The main issue to be addressed is how manufacturers can use their levers to resolve numerous hindrances of the carbon conundrum and avert climate change.

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

At this stage no.

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

a) An innovative project envisaging green hydrogen production is launched in Georgia. More and more countries are becoming interested in green hydrogen which is considered as the purest alternative of traditional, fossil energy. Georgia, having a large potential of development of renewable energy projects, plans to use this opportunity and position with green hydrogen at the world market.

The Memorandum of Understanding on development of the green hydrogen project was already signed between the Ministry of Economy and Sustainable Development of Georgia, Georgian Oil and Gas Corporation (GOGC), Batumi Municipality City Hall and the German Bank "KfW".

It is stated in the information disseminated by the Ministry of Economy and Sustainable Development that "Intention of the Parties to develop a green hydrogen pilot enterprise as well as its entire value chain (including demand and supply) with joint efforts is expressed in the signed Memorandum". It is also noted that the government pays particular attention to hydrogen energy development prospects in Georgia.

b) HeidelbergCement Georgia owns three cement plants in Kaspi (1) and Rustavi (2) regions, the cement terminal in Supsa and a grinding plant in Poti. HeidelbergCement started large scale investments aiming at technological revamcapital repairs, ping and expanding the plant's production and resulting in increased capacity up to 2 million tons of cement per year.

HeidelbergCement Georgia responds to environmental challenges of twenty-first century with a new project - modern dry line cement plant in Kaspi municipality. New Plant construction, having estimated investment costs of 100 MLN USD, started in 2016, and in the beginning of 2019 produced its first clinker.

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

Kaspi Dry Line produces 3000 tons of clinker per day, it is equipped with continuous emission monitoring system – for measuring dust, also nitrogen, sulphur and carbon oxide emissions.

c) The government of Georgia has developed a regulation that outlines the rules for collecting secondary animal fats from January 1, 2022. Biodiesel is produced from these types fats, which reduces harmful emissions in environmental. Production of biodiesel is a step towards energy independence for Georgia, as the country depends on imported fuel. Production will increase in the near future. The company working in this direction plans to build a new factory, which will be operate next year. The new plant will be 5 times larger than the existing one and will be able to produce 500 tons biodiesel per month.

It is planned to produce 1.5 million litres of products (biodiesel) in 2023, which is almost 50% more than in 2022.

Box 6. Answers to survey questions (Georgia)

LATVIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?

https://bankwatch.org/blog/latvia-s-repowereu-chapters-progress-made-and-necessary-investments

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

https://www.em.gov.lv/sites/em/files/necp_factsheet_lv_final1_0.pdf

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

https://www.zm.gov.lv/lv/media/1023/download?attachment

https://faolex.fao.org/docs/pdf/lat200100.pdf

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?

https://open.overheid.nl/documenten/ronl-04e554a7bd6920c75583f44aae42d0808fbdbc6e/pdf

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

https://pkc.gov.lv/sites/default/files/inline-files/Latvia%202nd%20VNR_2022_2pg%20%281%29_0.pdf

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?

By taking into account several priority areas for energy-related R&I. In the field of renewables, efforts are directed towards energy scenario modelling and socio-economic research focused on consumers, cost-benefit analyses, and policies.

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

https://labsoflatvia.com/en/news/eit-support-programs-for-startups-a-comprehensive-overview

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

The R&I and the promotion of its results may be particularly essential for the preparation of societal attitudes and behaviour change towards energy decarbonisation. R&I would assist the society to better understand the benefits and support the European Green Deal.

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
https://labsoflatvia.com/en/news/researchers-propose-burying-carbon-dioxide-to-mitigate-climate-change https://fei-web.lv/lv/petijumu-virzieni/energetikas-un-vides-tehnologiskie-un-ekonomiskie-petijumi/nodalas-projekti https://ccsw.lu.lv/index.php/en/main-2/	

Box 7. Answers to survey questions (Latvia)

LITHUANIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
-	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?
As of June 21, the Government of the Republic of Lithuania the NCEP (lith. NEKSVP) has presented NCEP and with the government's approval opened it for public discussions/ consultations. After public consultations NECP will be updated if needed and then submitted for EC approval. Currently foreseen measures are developed in a way to make sure that the NECP objectives are fully accomplished by 2030. However, the NECP can be open to further changes if such will be needed after currently discussed regulations such as NZIA, CRMA and Chips act are approved.	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
There 3 thematic roadmaps for in industry in Lithuania – industry digitalisation, integration into international value chains and circular economy roadmaps. Each of the roadmaps has a set of recommendations dedicated to skill gaps and measures foreseen for up-skilling. Circular economy roadmap has specifically identified skill and knowledge gap as a key priority to be addressed. Last year (2022) those three thematic roadmaps were integrated into one roadmap for advanced manufacturing which recognizes that favourable circumstances will not become success stories unless skills and knowledge assets are not managed. Skills earlier prioritised in three thematic roadmaps were mapped and analysed using the Conceptual model of industrial competition (An Industrial Competitiveness Model, DOI:10.1080/07408178608975342) and additional competence and skill gaps identified.	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

In general, the awareness of the skill-gaps is well known in the ecosystem. There are vocational training programmes that have modules on circular aspects of the manual jobs, there are new university programmes including master programmes for executives launched every year. Also, annual business awards include sustainability and circularity aspects of assessment. And not surprisingly in 2023 “Verslo žinios” (Business Newsweek) national nomination for sustainable business was the company that had implemented green energy solutions (solar, recuperation, co-generation) in energy intense manufacturing.

Lithuanian Innovation agency is preparing a new training measure for businesses that will cater directly for green-tech, circularity knowledge and managerial capability improvement. While national Science, technology and innovation council is developing measure for Lithuanian S3 priority sectors that will also include the green-tech/ decarb aspects.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?

The Ministry of Economy and Innovation is aware of currently revised state aid instruments, and we are using them for the specific measures. For instance, the measure „Implementation of alternative fuel in industrial enterprises in Kaunas, Šiauliai and Telšiai regions” is based on the 2023 Temporary Crisis and Transition Framework and the state aid will be delivered under this Framework.

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

So far Lithuania has foreseen the following measures that will affect the decarbonisation of the industry:

1. From the funds of Modernization Fund
   a. Implementation of production technologies that increase energy efficiency in industrial enterprises participating in the EU ETS.
   b. Increasing use of renewable energy resources in industrial enterprises participating in the EU ETS.
2. ERDF funds:
   a. Creating conditions for the sustainable transformation of industrial SMEs.
   b. Increase energy efficiency in industrial enterprises.
   c. Promoting the introduction of renewable energy resources in industrial enterprises.
3. Just Transition Fund will be released:
   a. Integration of electrolysis into the ammonia unit (30% H2 replacement) Phase I.
   b. Implementation of alternative fuel in industrial enterprises in Kaunas, Šiauliai and Telšiai regions.

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?

Smart Specialisation is a key instrument for place-based development in the European Union and as well as in Lithuania. It now represents the most comprehensive policy experience on innovation-driven development. Key challenges have been analysed while preparing new S3 strategy highlighting specific strengths and crucial gaps as well as opportunities and threats presented by accelerating Economic Transformation. It has a goal to achieve a substantial breakthrough in the three priority fields that Lithuania had identified as main areas for R&D and innovation:

- Health technologies, biotechnologies, and safe food.
- New production processes, materials, and energy efficiency.
- ICT technologies, inclusive and creative society.

Low carbon technologies are among new production processes, materials, and energy efficiency priority topics:
1. Photonic and laser technologies
2. Advanced materials and constructions
3. Flexible product development, production, and process management technologies
4. Strengthening energy efficiency and smart energy solutions
5. Use of renewable energy sources

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

R&D and innovation is supported through smart specialization priorities, including startups.

MoEI Innovative activities for the promotion of start-ups:

- **Promote the development of the startup ecosystem**. In Lithuania, startups lack specialized business acceleration programs based on the specificity of the products or services they create. It is planned - to implement specialized startup acceleration programs, to attract an international accelerator, to establish a business incubation centre of the European Space Agency.
- **Improve business access to financial sources (Innovation Fund).** In order to increase access to capital for businesses, especially startups, it is planned to expand the Innovation Promotion Fund. Fund instruments cover identified market shortfalls. With them, we will aim to promote investments in R&D and innovation.

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

Smart Specialisation is a key instrument for place-based development in the European Union and as well as in Lithuania.
Low carbon technologies are among new production processes, materials, and energy efficiency priority topics:
1. Photonic and laser technologies
2. Advanced materials and constructions
3. Flexible product development, production, and process management technologies
4. Strengthening energy efficiency and smart energy solutions
5. Use of renewable energy sources

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

We have been consistently working on green technologies and ecological product design. Two measures (Eco-innovation and Eco-innovation+) for sustainable business and industry were implemented between 2014-2020, 177 projects were financed in total. The projects shall be continued and renewed during 2021-2027 financial period.

Currently one of the major projects is implemented through Just Transition Fund, where one of the major region's fertilisers' producers - "Achema" - is developing and installing technologies to move from gas to hydrogen-based processes. This will include integration of electrolysis into the ammonia unit (30% H2 replacement). Project value: 270 million EUR, to allocate 122.65 million. EUR JTF funds, of which 122.56 million EUR would be allocated for investments in the creation of infrastructure while 90 thousand. EUR for employee training.

Other examples could be financed projects through the measures of the Modernization Fund, that includes the call for the "Use of renewable energy resources in industrial enterprises participating in the EU emissions trading system" which was published on 06.10.2022, applications were accepted until 02.01.2023. In total 16 industrial companies participating in the EU emissions trading system were interested in investing in renewable energy resources, which applied for a little more than 13 million. Euros of financing. After evaluating the applications, funding was allocated to 7 applicants, for whom the entire measures funding of 10 million EUR was allocated.

Box 8. Answers to survey questions (Lithuania)

PORTUGAL

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?

On **26 May 2023** Portugal **submitted** a request to the Commission to revise its recovery and resilience plan and **add a REPowerEU chapter**. The REPowerEU chapter proposed by Portugal includes 6 reforms and 18 investments, focusing on energy efficiency in buildings, renewables and biogas, sustainable transport, the electricity grid and green industry.

With regard to increasing the competitiveness of the economy, the Portuguese Government has highlighted, among other measures, the financial **reinforcement of the approved "Mobilizing Agendas or Green Agendas for Business Innovation"**[20] (Agendas Mobilizadoras e Verdes) (from 930 million euros to 2,8 billion euros), the **creation of a National Center for Advanced Computing**, and support for hiring of researchers with highly competitive profiles at international level.

20 RRP – Component 5

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

Portugal was one of the first EU countries to commit to net zero emissions by **2050** and published in **June 2019** its long-term strategy for **carbon neutrality**.

At the COP 27 - Egypt, on 08 November 2022, the Portuguese Prime-Minister, António Costa, stated that *"With the entry into force of the first Climate Framework Law in 2022, we have reinforced our goal of achieving carbon neutrality by 2050, committing ourselves to study and prepare its **anticipation** to **2045**".*

The Portuguese National Roadmap for Carbon Neutrality 2050 identified the emission reduction trajectories for the various sectors of the economy and the technological options with potential to operate the transition. The main goal is to move towards a low carbon, circular economy, focused on the use of natural resources in a sustainable way.

The National Energy and Climate Plan 2021-2030 (PNEC 2030[21]) sets the targets to **2030** (as part of the Roadmap), establishing the main reforms for the decarbonisation of the industry sector.

It was approved on **21 May 2020** and establishes the goals, objectives, lines of action and policies on energy and climate, duly related to the 5 dimensions of the Energy Union, namely: **Decarbonisation**; **Energy Efficiency**; **Internal Energy Market**; **Energy Security**; and **Research, Innovation and Competitiveness**.

It represents an opportunity to accelerate decarbonisation, the energy transition, change the paradigm of resource use, improve the industry's environmental performance, and consolidate its contribution to a trajectory of carbon neutrality.

Currently, there is **an ongoing revision of the PNEC**. In fact, Article 14 of Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December on Energy Union Governance and Climate Action provides for the mandatory periodic review of the NEEAP (National Energy Efficiency Action Plans) by the Member States, which should reflect a higher level of ambition than that set in its first version, **with the draft revision of the plan to be sent to the European Commission by 30 June 2023**.

To comply with this obligation, the Directorate General for Energy and Geology (DGEG) and the Portuguese Environment Agency, I.P. (APA) are coordinating the review of the PNEC 2030. To ensure that this was a **participatory process**, it was intended to listen to society views on the objectives, goals, and major lines of action of PNEC. By using the Portal PARTICIPA, which provided all interested parties with a survey that could be answered until 14 April 2023, it was possible to collect their contributions or suggestions under the review process of the PNEC 2030. **The results are still under analysis**.

Regarding the national R&I investments in EII, we are still gathering data among other government bodies. When PNEC was initially released (2020) the research and innovation policies and measures were:
Research and Innovation Strategy for Smart Specialisation EI&I, 2014-2020 (23 December 2014);
Thematic Agendas for Research and Innovation 2030, under development by the Foundation for Science and Technology, I. P. (FCT, I. P.) (03 June 2016).
Portugal was also jointly developing 15 Thematic Agendas for Research and Innovation, coordinated by FCT, I. P., which aimed, namely, to mobilize experts from R&D institutions and companies to identify challenges and opportunities within the national scientific and technological system.
In these circunstances, the Portuguese Government has made a **commitment** to invest globally **3% of GDP by 2030 in R&D**. The targets that Portugal proposed for 2030, in terms of energy and climate and a path towards carbon neutrality by 2050, imply a continuos growth in investment in low-carbon

21 Resolution of the Council of Ministers n.º 53/2020, of July 10, approves the National Energy and Climate Plan 2030 (PNEC 2030)

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

technologies. It is thus assumed that R&D investments in energy and climate will see their weight in the national effort grow until 2030.

Action line 7.5. of the PNEC, entitled PROMOTE R&D PROJECTS THAT SUPPORT AN INDUSTRY INNOVATIVE AND COMPETITIVE AND LOW CARBON, aimed at supportting the development of research and innovation for industry and manufacturing, through the **development and adoption of advanced technological materials and processes**.

To promote R&D&I projects that support the transition to a more innovative, competitive and low-carbon economy, the following action was proposed:
7.5.1. Promoting linkage with the Thematic Agendas for Research and Innovation of the Foundation for Science and Technology, I. P.

This articulation extends to the **Collaborative Laboratories**, as they aim to implement the research and innovation agendas. Since 2017, the "Interface Program" has supported collaborative R&D, with the aim of promoting the transfer of technology from universities to companies through support for knowledge transfer infrastructures by supporting knowledge transfer infrastructures such as Interface Centers (CTI) and Collaborative Laboratories (CoLAB). Currently, Portugal has 35 entities recognized as CoLABs and 26 entities recognized as CTI.

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

The PNEC recognizes that the investment associated with the decarbonisation of the economy is a driver of innovation and skilled employment, especially in green sectors.

In order to boost job creation associated with new investment, it is necessary to safeguard employment in sectors that will have to adapt. It is therefore essential to **take into account the specificities of the different sectors and to ensure specific measures for the most energy-intensive sectors**, focused on supporting the transition, regarding both the reconversion of activities and workers, in particular in the regions that may be most affected by such a transition. Thus, it is critical to **create skills oriented towards the jobs of the future**.

The promotion of research, innovation and competitiveness (R&I&C) in support of the implementation of the PNEC is essential for the success of the plan, taking into account the various national competences as well as their framework at the level of cooperation and ongoing activities within the European Union.

Although there are no specific action lines regarding skills in Objective 7, entitled DEVELOPING AN INNOVATIVE AND COMPETITIVE INDUSTRY, the following action lines are defined in Objective 2 — PRIORITISE ENERGY EFFICIENCY:

ACTION LINE 2.5. PROMOTING VOCATIONAL TRAINING FOR THE ENERGY EFFICIENCY SECTOR:

- 2.5.1. Promote new training for specialised technicians in the energy efficiency and renewable energy sector
- 2.5.2. Promote training for technicians and specialists in the field of construction and NZEB (Nearly Zero Energy Buildings) buildings.

The PNEC revision might bring some news regarding this issue.

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

In general terms, the Portuguese Government considers that developing and fostering a skilled workforce is crucial for our country's prosperity, competitiveness, and overall well-being.

Taking a holistic approach, skills development is not limited to formal education or specific occupations. It encompasses a wide range of abilities, including technical skills, digital literacy, problem-solving, critical thinking, creativity, and adaptability. Cultivating a diverse set of skills that can be applied across industries and job sectors will be of the utmost importance.

The Portuguese Government considers it is essential to explore the potential for stronger collaborations between educational ecosystems, training entities, incubators, and accelerators at both national and regional levels. Moreover, promoting collaborative efforts through public-private partnerships and sector-specific skills councils is also key to identify skills gaps and design relevant training initiatives tailored to industry needs.

More than 20% of the Portuguese Recovery and Resilience Plan is allocated to investments in the digital transition. Among the various measures, in respect to digital capacity building and in close collaboration with the public entities responsible for employment, vocational training, and qualifications, there are two interconnected training programs aimed at bridging the digital skills gaps of workers and companies: the “Portugal Digital Academia” program and the “Employment more Digital” (Emprego +Digital).

In the scope of the digital transition of companies, the RRP also includes the “Coaching 4.0” initiative, which aims to integrate technology in companies, by supporting the development of processes and organizational skills that encourage the digital transformation of businesses.

We can also underline a Portuguese initiative called “SME Digital Academy”, a platform for the development of entrepreneurial skills that encompasses a wide range of training options, such as financial literacy, digital skills training, entrepreneurship, and circular economy and sustainability for SMEs.

We also highlight the following projects:

- Portugal has a **National Network of Incubators** that interconnects existing incubators and accelerators in the country, created at the initiative of universities, scientific and technological centers, municipalities, private companies, or foreign entities. This network promotes cooperation and sharing of resources and knowledge, with the aim of improving the resources and services available to entrepreneurs and incubated companies.
- The **National Network of Digital Innovation Hubs (DIH)** provides services and support for the digital transformation of SMEs and the Public Administration, including: (i) experimentation - testing before investing; (ii) training and development of specific skills; (iii) access to a network of partners; (iv) identification of incentives and financing; and (v) provision of incubation services.
- Within the framework of the European Network of Digital Innovation Hubs (EDIH)[22], the EID Catalogue aims to reunite, in a single platform, all the information available on each of the Digital Innovation Hubs that make up the European network.
- It should be noted that of the National Network of 17 DIH, 16 have proposed to join the European Network and have achieved their objective. **The 16 national consortia are part of the European DIH Network**, 3 as European DIH, co-financed by the Digital Europe Programme and RRP, and 13 recognised with Seals of Excellence and funded entirely via RRP.

[22] The EDIH network is coordinated by the Digital Transformation Accelerator (DTA) which, together with the European Commission, provides opportunities for interaction and collaboration between EDIH, SMEs and the public sector

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?

The Portuguese authorities are aware of the public consultation on State subsidies – exemptions to approval requirement for the Green Deal and EU industrial and digital Strategies, which took place on March 2021, and the consequent revision on March 2023.

While GBER rules are largely fit for purpose, some changes to these exemptions were needed to reflect EU priorities, specifically the Green Deal and the industrial and digital strategies.

Regarding the 2023 Temporary Crisis and Transition Framework, it is also of authorities' knowledge, but we do not yet have data on its practical implementation.

(We are still lacking concrete information regarding the practical application of the specific state-aid instruments in Portugal and will further update this information at a later date).

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

We can highlight **Portugal 2020** and **Portugal 2030** structural funds programs (Partnership Agreements between Portugal and the European Commission) that include funding programs that support industrial decarbonisation initiatives.

The **Portuguese Environmental Fund** (Fundo Ambiental) also provides financial support for projects and initiatives aimed at protecting the environment and promoting sustainable development, some within the scope of the RRP funds. It includes funding opportunities for energy efficiency improvements, and renewable energy adoption.

With the **"Mobilizing Agendas or Green Agendas for Business Innovation",** under **Component 5 - RRP**, all relevant entities from businesses, scientific and technological entities, or public agencies, participate to identify real investment opportunities, with a view to launching new products and services of greater added value in the market.

The main purpose is to consolidate and expand the synergies between the business fabric and the scientific and technological system in Portugal, contributing to increasing competitiveness and resilience of the Portuguese economy. This transformation is based on R&D, innovation and diversification and specialization of the production structure, where large companies and entities of the scientific and technological system work together with SMEs, universities and polytechnics or research and technology centres.

Also noteworthy is the **Component C11 Decarbonisation of industry - RRP** which includes projects from the following areas: 1) **Low carbon processes and technologies in industry**; 2) Adoption of **energy efficiency measures in industry**; 3) Incorporation of **renewable energy and energy storage**; 4) Support for the **capacity building** of companies and the development of information and support tools, such as **sectoral roadmaps[23] for carbon neutrality in industry.**

[23] 39 itineraries were selected in the sectors Wood, Cork and Furniture (9), Construction Material (8), Metal (8), Food (7), Mechanics and Electronics (7), Transport Equipment (6), Textile, Clothing and Footwear (6), Oil and Chemical (4), Rubber and Plastic (3), Paper and Publications (4), Extractive Industry (3), and Pharmaceutical (2).

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?

(We are still waiting to obtain the most accurate and up-to-date information on these programs and other relevant programs).

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?

Innovation and Research (R&I) investment programmes generally take into account ex-ante conditions (i.e., existing conditions before the implementation of the programme) when defining the priorities of national decarbonisation programmes and strategies. This is because decarbonisation requires an integrated and holistic approach, considering the specific needs and challenges of each country or region.

Usually, R&I investment programmes take into account the following ex ante conditions when prioritising national decarbonisation programmes / strategies:

- Assessment of existing resources; Analysis of decarbonisation challenges and targets; Stakeholder consultation; Assessment of emerging technologies; Economic analysis and feasibility.

This approach helps guide investments in innovation and research.

(We are still waiting to obtain the most accurate and up-to-date information on these programs and other relevant programs).

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

There is an understanding that the global economy is undergoing significant transformations driven by two major transitions: green and digital. Both offer immense opportunities for economic growth, innovation and sustainability. In this context, SMEs and entrepreneurs play a crucial role in driving these transitions, as they are agile, innovative, and adaptable to change, so it is important to promote their contribution to the green and digital transitions.

However, many SMEs and entrepreneurs face challenges in accessing the necessary funding and other resources to implement green and digital initiatives.

In this regard, Portugal implemented **financial assistance programs, grants and loans to address liquidity challenges and sustain business operations, with a particular focus on phasing out crisis measures**.

Through **Banco de Fomento** - a Portuguese financial institution created with the purpose of providing financial capacity to the national business ecosystem with a special focus on investing in sustainable, carbon neutral and circular economy – the **creation of venture capital funds for the development of SMEs** is supported.

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

The Portuguese **"PME Líder" programme**, implemented with the banking sector, gives SMEs a rating that allows them to benefit from better financing conditions and tailored services from banks and other financial service providers.

Portugal's Recovery and Resilience Plan is focused on measures that to promote and financially support projects and new processes for low carbon technologies in industry and industrial energy efficiency, incorporating renewable energy sources, adopting "circular economy" principles and promoting eco-innovation, namely through increased, green-related R&D investments in SMEs and start-ups.

"Component 11" of the RRP specifically supports the decarbonisation of industry, (in accordance with the PNEC 2030). As stated before, the incentive system aims to promote and financially support the following projects: i) Low carbon processes and technologies in industry; ii) Energy efficiency measures in industry; iii) Incorporation of energy from renewable sources and energy storage; and iv) development of industry decarbonisation roadmaps.

The **sectoral roadmaps for carbon neutrality**Error! Bookmark not defined. allow the identification o f technological solutions and innovative processes that are simultaneously effective, specific for national industry and efficient in terms of costs, namely in Energy Intensive Industries (EII). The final beneficiaries are business associations and technological centres of the different industrial sectors.

"Component 5" of the RRP also includes investments and reforms that contribute to accelerate low-carbon innovation, particularly capitalization and business innovation, with the aim of increasing the competitiveness and resilience of the Portuguese economy based on R&D innovation and diversification.

The **Mobilising Agendas for Business Innovation**, which include the so-called **Green Agendas**, aim to consolidate and expand synergies between the business fabric and the scientific and technological system in Portugal, contributing to increasing the competitiveness and resilience of the Portuguese economy, based on R&D, innovation and the diversification and specialisation of the production structure.

It is also relevant to mention that the regulatory frameworks are up-to-date and support the green and digital transitions of SMEs and entrepreneurs, while also reducing administrative burden. Portugal is trying to foster an environment that promotes innovation and experimentation, while ensuring compliance with environmental and digital standards.

Technological Free Zones (ZLT) are a good example of a "safe space" in which companies can test innovative products, services and business models for new technologies that need specific and adapted regulatory regimes.

As an example, on 21 June 2023, the Portuguese Government approved the creation of the new Technological Free Zone of Matosinhos[24], which aims to contribute to affirm Portugal as a reference in the development, testing and experimentation of innovative mobility solutions oriented to the carbon neutrality of cities. It will accelerate the transition of products and services to the market and stimulate the capacity for innovation and internationalization of Portuguese companies and start-ups.

Portugal is also prioritizing investments in education and training programmes that provide SMEs and entrepreneurs with the necessary **skills** to navigate the digital and green transitions.

[24] The managing entity of this ZLT is CEiiA – Engineering and Development Centre -, integrating the area of the Port of Leixões and including the marginal strip of the maritime public domain that covers the area of jurisdiction of APDL - Administração dos Portos do Douro, Leixões e Viana do Castelo, S.A.

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

Finally, the Portuguese government also encourages SMEs and entrepreneurs to **collaborate** with larger organizations, research institutions and government agencies to share knowledge, resources and best practices.

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

We can point out **synergies** and complementarities between our Recovery and Resilience Plan (**RRP**) and Cohesion Policy Funds (**Partnership Agreement Portugal 2030**), namely concerning the C11 Component of the RRP – Decarbonizing Industry and COMPETE 2030 implemented under the Programme "Portugal 2030".

The Portuguese **"Interface Program"** supports collaborative R&D, with the aim of promoting the transfer of technology from universities to companies through support for knowledge transfer infrastructures such as Interface Centers (CIT) and Collaborative Laboratories (CoLAB).

The **"Mobilizing Agendas or Green Agendas for Business Innovation",** (RRP – Component 5), in which all relevant entities from the world of business, scientific and technological ecosystem, or public agencies participate, with the aim of identifying real investment opportunities and execution capacities using R&D+I to develop/launch new products and services of greater added value.

With this approach, 53 agendas were selected that mobilised 1200 entities, including 900 companies. From new micro-satellites for earth observation to new packaging solutions using paper pulp to replace plastics, new automation solutions for labour intensive industries like footwear or textiles and garments, new protein sources and bio plastics from insect farming, these are just some examples that this initiative will deliver until 2026.

(We are still lacking concrete information regarding the practical application of the specific state-aid instruments in Portugal and will further update this information at a later date).

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

Portugal has been actively pursuing innovative low-carbon technologies and implementing first-of-a-kind installations to address climate change and promote sustainable development. Here are a few notable examples:

Wind Energy: Portugal has made significant progress in wind energy production. The country's windy coastal regions, such as the Alentejo and the northern coast, have attracted investments in wind farms.

In 2021, Portugal achieved a significant milestone by generating more than 59% of its electricity from renewable sources, with wind energy playing a crucial role.

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

Solar Energy: Portugal has also been investing in solar energy installations. The country has abundant sunshine, which makes it suitable for harnessing solar power. As an example, at the Alqueva Dam there is one of the largest floating solar parks in Europe.

Portugal has also been promoting the installation of solar panels on rooftops and has implemented various incentive programmes to encourage the adoption of solar energy, namely under the "Environmental Fund".

Wave Energy: Given its long coastline, Portugal has been exploring wave energy as a renewable energy source. The Portuguese coast is known for its strong waves, making it a potential location for wave energy converters.

Located about 20 km off the coast of Viana do Castelo, where the waters reach a depth of 100 meters, the WindFloat Atlantic (WFA), the first state-of-the-art offshore wind farm in continental Europe, is being built. This initiative has had the support from public and private institutions, encouraging the participation in the project of leading companies in their respective markets; while the Government of Portugal, European Commission and the European Investment Bank have provided financial support.

Viana do Castelo will also anchor a new **Technological Free Zone.** This offshore and nearshore renewable energies ZLT will develop production of electricity projects from renewable energies of ocean source.

Electric Mobility: Portugal has been promoting electric mobility to reduce greenhouse gas emissions from the automotive sector. The country has implemented a comprehensive network of electric vehicle charging stations, making it easier for electric vehicle owners to charge their vehicles.

Hydrogen Technology: Portugal is actively exploring the potential of hydrogen as a clean energy source. The country has launched several projects to develop hydrogen infrastructure, including hydrogen production, storage, and distribution facilities. These initiatives aim to utilize use hydrogen in sectors such as transportation, industry, and power generation and energy production, thereby reducing dependence on fossil fuels.

Portugal has unique conditions to be an energy supply platform for Europe and other parts of the world. It can supply LNG through the **Port of Sines**, which is also expected to become an **international green hydrogen hub**, starting with 265 MW and increasing to 2.5 GW by 2030.

Under the Global Gateway Initiative, Sines is also close to the entry points of some **submarine fiber optic cables,** for the digital connection and data transmission with other geographies. ("EllaLink" – connection from Portugal to Central and South America and "Equiano" – connection to the African continent).

Box 9. Answers to survey questions (Portugal)

SLOVAKIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?

Yes, the updated RRP with REPowerEU chapter was approved by the Govt on 26th of April 2023. It contains a total of six reforms and eight investments, divided into four areas - energy and permitting processes, renovation and management of buildings, sustainable transport, as well as the development of green skills.

As part of the Recovery Plan, we are trying to implement the decarbonisation of the industry through component 4, for which it is already drawing funds and carrying out the actions in question. We have no information about the additional chapter in the matter.

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?

The Government of the SR approved the National Strategy for Research, Development and Innovation 2030 with an Action Plan which also covers measures related to the implementation of SK RIS3 2021 +.

The Ministry of Economy is currently preparing an update of the integrated national energy plan, approved in December 2019. The above strategy and the action plan adopted will be taken into account in the preparation of the energy and climate plan as well as in its final version.

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?

In 2021 the Slovak Government approved Research and Innovation Strategy for Smart specialization of the Slovak Republic 2021-2027 which is a strategic document defining the objectives, policy system and measures in the field of research, innovation and human resources that will support the structural change of the Slovak economy towards growth based on increasing research and innovation capacity and excellence in the segments with the highest competitive potential. It is the core document setting the baseline for the content of the European Union Cohesion Policy funds for the period 2021-2027. Mentioned strategy is in line with the low carbon strategy of Slovakia. (https://www.mirri.gov.sk/wp-content/uploads/2018/10/Research-and-innovation-strategy-for-smart-specialisation-of-the-Slovak-Republic-2021-2027.pdf)

In March 2023 The Government of the SR has endorsed the National Strategy for Research, Development and Innovation 2030 with an Action Plan which also covers measures related to the implementation of SK RIS3 2021 +.

SK RIS3 2021 +' is a strategic document setting out objectives, a system of policies and measures in the field of research, innovation and human resources that will support the stimulation of structural change in the Slovak economy towards growth based on increased research and innovation capacity and excellence.

In the case of the Recovery Plan, the subject of support is projects in industrial sectors aimed at reducing greenhouse gas emissions beyond the applicable Union standards regarding environmental protection or increasing environmental protection in the absence of Union standards.

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
In the case of national strategies, it is individual, they are mostly updated in smaller periods of time, mostly within 5 years.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Yes, we are aware of these tools and the GBER regulation is the legal basis for our implemented state aid schemes to support the projects form the Modernisation Fund resources	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?
Yes, under the Component 4 of Recovery Plan have already been and are planned several calls aimed at decarbonisation of industry. Also under Component 9 we are going to announce calls on supporting R&D projects which are focused on decarbonisation of industry. Yes, under the Modernisation Fund there are several state-aid schemes focused on the support the decarbonisation of industry and heating and cooling sectors. The calls have already been launched, the applications for support are in the approval phase, and some have already been approved with the subsidy contracts signed.	

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
R&I calls from Recovery Plan (Component 9) do not take directly into account ex-ante conditions defined in national strategies like Low-carbon Development Strategy of the Slovak Republic until 2030	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
We register large enterprises, including state-owned enterprises, that have progressed in the expansion of low-carbon technology. Up to this date, we are not aware of any of such mechanisms especially for start-ups or SMEs. However, we plan to open the calls on green transition, decarbonisation of industry and R&D in this field that are aimed at all types of companies regardless of their size.	

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
-	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
Under the state aid schemes aimed at supporting the decarbonisation of industry, projects using the modern technologies in the steel industry will be supported. Two applications for support from the Innovation Fund for the introduction of innovative technologies were also submitted, but they were not successful.	

Box 10. Answers to survey questions (Slovakia)

SLOVENIA

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
Yes. Slovenian REPowerEU Programme focuses on green investments in different infrastructure. There are no instruments for R&I included.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?
R&I investments in EII are low in this period, investments in available new energy sources are the priority. National Climate and Energy Plan focuses in R&I on strengthening of existing research and development programs in the field of energy in accordance with the objectives of the NEPN and the Resolution on the Long-term Climate Strategy of Slovenia until 2050 (ReDPS50), with an emphasis on research on technologies for the use of hydrogen and technologies for obtaining and using green electricity	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
• We are developing up-skilling initiatives aimed at accelerating the uptake of new low-carbon technologies requires a collaborative effort between governments, educational institutions, industries, and individuals. • We have plans to set up national Circular Centre to support the transition towards a circular economy.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
Slovenia has implemented several national instruments and programs to support industrial decarbonisation and the transition to a low-carbon economy (The Eco Fund (Eko Sklad) is a Slovenian environmental fund that provides financial incentives and support for various environmental and energy efficiency projects, The Slovene Enterprise Fund (Slovenski podjetniški sklad) is a government institution that provides financial instruments and support to Slovenian businesses for projects and investments implementing environmentally friendly practices and technologies) Slovenian ministries periodically announce public calls for funding aimed at supporting different aspects of industrial decarbonisation. These calls target specific industries or technologies and provide financial support for projects related to energy efficiency, renewable energy adoption, clean technologies, and carbon footprint reduction.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?
Yes	

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
In Slovenia, before planning instruments, we usually prepare a risk assessment and plan goals and potential effects to increase the chances of success and mitigate potential challenges.	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
Yes, but not specially for low-carbon technologies, but the criteria for obtaining national funds are conditional on placement in green technologies, processes or services.	

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?
EIC Accelerator (in Slovenia not in place jet, but it will follow the SME instrument steps).	

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?
Geothermal Power Plants: Slovenia has significant geothermal resources, and the country has been actively utilizing them for clean energy production. Several geothermal power plants have been established.	

Box 11. Answers to survey questions (Slovenia)

TÜRKIYE

Update of the REPowerEU chapter	Is your country preparing the new REPowerEU chapter of the Recovery and Resilience Plan? If yes, what is the current situation?
While Türkiye is not a member of the EU, it has been involved in discussions with the EU on various matters, including potential cooperation in the energy sector. However, Türkiye is not preparing the new REPowerEU chapter of the Recovery and Resilience Plan.	

Update of the National Energy and Climate Plan (NECP)	Can you provide an update on your National Climate and Energy Plan in terms of where you stand with the national R&I investments in EII?
The Türkiye National Energy Plan was published on December, 2022 by the Ministry of Energy and Natural Resources. While there is no direct connection between the Green Growth Technology Roadmap (GGTR) and NECP, they are compatible in terms of hydrogen and renewable energy topics. NECP puts forth the objectives on the energy production and distribution sector, while GGTR presents objectives for energy use in industry. The Climate Council draws the main framework for the Climate Mitigation and Adaptation Action Plan. Also, inputs from the Green Growth Technology Roadmap studies have been provided to the NDC efforts. The Ministry of Environment, Urbanization and Climate Change of Türkiye prepares Türkiye's Climate Change and Adaptation Strategy, and inputs from roadmap studies have been provided to this work.	

Support for up-skilling in accelerating the uptake of technologies	To what extent does the national roadmap/strategy consider support for up-skilling aimed at accelerating the uptake of new low-carbon technologies?
The Green Growth Technology Roadmap of Türkiye recognizes the importance of up-skilling and capacity building to support the adoption and uptake of new digital low-carbon technologies. The roadmap identifies the need for workforce training and development to support the transition to a green economy and includes measures to promote the development of skills and competencies in different industries. In the future, it is planned for TÜBİTAK scholarships and supports to focus on this subject.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of specific state-aid instruments such as the recently revised (March 2023) General Block Exemption Regulation or the 2023 Temporary Crisis and Transition Framework that facilitate the deployment of public funds to support your industrial decarbonisation programmes/sector-specific strategy?
We don't have specific information about state-aid instruments such as the revised General Block Exemption Regulation in March 2023 or the 2023 Temporary Crisis and Transition Framework.	

State-aid instruments and specific schemes supporting industrial decarbonisation	Are you aware of any state-aid schemes in your country that support industrial decarbonisation programmes/strategy?
Türkiye has been financing large-scale investments from its national budget to combat climate change. The Turkish private sector is undertaking concrete measures to decrease GHG emissions. In recent years, many companies operating in Türkiye disclosed their mitigation targets and implementation roadmaps to accelerate progress towards Türkiye's 2053 net zero target. However, beyond domestic public and private sources, Türkiye needs significant international financial support for its climate-friendly technical assistance.	

Role of ex-ante conditions in setting priorities	In which way R&I investment programmes takes into account ex-ante conditions at the point of setting the priorities of national decarbonisation programmes/strategy?
R&I investment programmes consider factors such as the current state of the economy, technological advancements, market trends, policy frameworks, and social considerations. Also, R&I investment programmes are designed by the support of the industry and academia. By analysing ex-ante conditions, R&I investment programs can determine priority areas for research and innovation that align with the specific needs and challenges of the decarbonisation agenda. This allows for targeted investments in sectors, technologies, and solutions that have the potential to deliver significant emissions reductions and contribute to the overall decarbonisation strategy of a nation.	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?
There are several financing mechanisms and initiatives in place in Turkey to support start-ups and SMEs in scaling up low-carbon technologies. Some of them are The Turkish Scientific and Technological Research Council (TÜBİTAK), The Small and Medium Enterprises Development Organization (KOSGEB) and The Technology Development Foundation of Turkey (TTGV). The "Green Transformation Support Program" has been implemented by KOSGEB with the aim of identifying the current situations of SMEs regarding green transformation, determining their problems and needs, creating necessary strategies in this regard, enhancing their capacities according to these strategies, and meeting their priority needs. TÜBİTAK, through the Industrial Innovation Network Mechanism, supports the development of products or product groups aimed at green transformation. The Ministry of Industry and Technology, TÜBİTAK, and KOSGEB are carrying out the Turkey Green Industry Project with the support of the World Bank. The project, with a total budget of 450 million	

Start-up and SME targeted financing mechanisms	Are there any start-ups and SME-targeted financing mechanisms in place specifically to scale up low-carbon technologies?

US dollars, aims to support the sustainable and efficient green transformation of the industry in Turkey.
TTGV) provides financial support to implementation projects in the fields of climate-friendly technologies, clean production technologies, energy efficiency, renewable energy, and other energy technologies carried out by industrial organizations through its Green Technology Projects support.

Synergies between National and EC R&I programmes	Are you aware of and do you find synergies between national and EC R&I investment programmes for low-carbon technologies? Can you give any example?

Türkiye has been involved in various collaborative initiatives with the EC, including those related to R&I. While Turkey is not a member of the EU, it has participated in several EU Framework Programs for Research and Technological Development as an associated country.
Following the announcement of the European Green Deal in December 2019, Turkey has begun to track this profound transformation and develop new policy areas and strategies.
Under Horizon Europe, there have been opportunities for collaboration and synergies between Turkish and European R&I programs for low-carbon technologies. Within the Clean Energy Transition Partnership (CETPartnership) and Clean Hydrogen Partnership, several projects are being supported to facilitate the implementation of low-carbon technologies.

Demonstrators and first-of-a-kind (FOAK) plants	Would you have any examples of recently completed or on-going projects of decarbonisation investments in your country, concerning, in particular, innovative low-carbon technologies or first-of-a-kind installations?

Türkiye's Nuh Cement has already innovated in mining fleet electrification via converting its diesel hydraulic shovels to electric operation with cable reels and electric motors. With the aim to save another 1 million litres of diesel fuel annually it is now converting its diesel-fuelled dump trucks to battery electric.
Akçansa's Çanakkale Factory has implemented an alternative fuel feeding system project and made improvements in the kiln process to reduce heat and electricity expenditures. As a result, the usage rate of conventional energy sources has been decreased, enabling the production of energy from both renewable sources and kiln temperatures. This has resulted in a reduction of 28,100 tons per year of CO_2 emissions.

In 2019, the European Bank for Reconstruction and Development (EBRD) approved a loan to support the construction and operation of a biogas plant in Izmir, Türkiye. The facility aimed to utilize organic waste to produce renewable biogas, which could be used for electricity generation.

In 2019, the Istanbul Metropolitan Municipality announced plans to develop a large-scale renewable energy integration project. The project aimed to reduce carbon emissions and enhance energy efficiency by implementing various renewable energy technologies, such as solar and wind power.

Box 12. Answers to survey questions (Turkey)

Annex II: National strategies - some examples

Can you explain here where you received these findings from? I guess this is coming from the presentations during the Vienna meeting!

Austria

The roadmaps of Austria are based on a target to make Austria climate neutral by 2040 and inspired by the need to initiate the transformation now due to the long investment cycles. The high OPEX and CAPEX costs argue for a need for early planning reliability. This asks for flexible funding instruments, the avoidance of over-funding and the guarantee for long-term planning of investment decisions. The roadmapping is based on a stakeholder involvement, taking into account the National and European strategies.

The developed funding instrument, 'Transformation of Industry', foresees pilots & demos as well as industrial (FOAKs) projects with respectively TRL6-7 and TRL8-9. The funding foresees also in OPEX funding up to 10 years and uses quantitative award criteria (expressed in €/ton CO_2eq) based on GBER 70%.

The funding instrument focuses on:

1. Alternative fuels and raw materials
2. Integration of renewables & energy efficient processes
3. Electrification of production & processes
4. Carbon capture, sequestration, usage and storage
5. Material efficiency, circularity & industrial symbiosis
6. Use of green H2

On top of that, Austria, together with Australia, is the co-lead of the Net Zero Industries Mission (NZIM). This Mission is a collaboration across countries, government, and industry to drive and accelerate the adoption of decarbonisation technologies by the hard to abate, energy intensive industries.

Georgia

In contradiction to the EU-Member States, Georgia still has a young and strongly growing economy, which leads to an increase in GHG emissions of 90% since 2015. The industry (quarrying & mining, food & beverages, metals & mineral, chemicals) is responsible for 17% of the GHG emissions (6-million-ton CO_2 by 2030 of which 2/3 from industry and 1/3 from electricity).

Georgia agreed on an NECP with the EC. It is based on voluntary energy consumption savings by the EIIs (followed later by the less energy intensive industries) but with dedicated incentives.

Georgia has set up the LT LEDS concept (24/4/2023), which defines the GHG emissions, a reduction perspective and a vision to become climate neutral by 2050. This counts for the

industry, energy, agriculture & waste. This is also accompanied by an SME Development Strategy (2021-2025), providing financial support, and broadening the definition of green credits (Taxonomy).

Sustainable funding opportunities are provided via Enterprise Georgia (support new enterprises) and the Innovation & Technology Agency (GITA) to support innovation in the industrial and scientific world. The Shota Rustaveli National Science Foundation of Georgia (SRNSFG) is a foundation to promote Georgia's integration in the international STI system and to promote the international scientific collaboration. A law regulates the Public-Private Partnerships.

Spain

Spain has set up General Guidelines for a New Industrial Policy 2030 on which axe 9 is about Sustainability meaning mainly decarbonisation & circular economy. The NECP is accordingly updated.

Spain created the PERTE Industrial Decarbonisation Strategic Projects for Economic Recovery and Transformation as a framework for aid schemes in the RRF (27/12/2022) and with an emission reduction target of 13 million tons CO_2eq/year. It is based on:

1. General aid for decarbonisation of industrial processes (1/3 grants, 2/3 loans)
2. Grants for green H2 under IPCEI
3. Feasibility study for a CCfD to support industrial decarbonisation
4. Aid for greenfield zero-emission installations (no support to fossil use and limited to ETS sectors).

The whole strategy was created via 'manifestation of interest' by stakeholders and managed by a special commissioner. Other programs are:

- PERTE circular economy
- PERTE renewable energy, hydrogen, E-storage
- Aid to renewable energy to replace fossil fuels
- Aid to greenfield projects for manufacturing of net-zero machinery & technology (e.g., heat pumps, equipment for renewable energy generation, H2 electrolyzers etc.)
- Some regional support

Portugal

In Portugal, 59% of electricity is already on a renewable basis (26% wind, 23% hydro, 7 % biomass and 3.5 % PV) and they want to achieve 80% by 2026. The EIIs in Portugal use 23% of the electricity and 30% of the gas.

Portugal will implement its National Strategy for Industrial decarbonisation until 2030 via the NECP. It is further supported by a Hydrogen roadmap and action plan.

In the RRP, the Innovation & Digital Transition is established via Portugal+ Green and Portugal+ social objectives. The REPowerEU chapter contains 6 reforms and 18 investments. Under Component 5 (Capitalization & Business Innovation) 16 agendas are selected for support. Under Component 11 (Decarbonisation of Industry) industrial competition and transition is supported by 1102 projects on:

- Low carbon process & technologies
- Energy efficiency measures
- Energy from renewable sources and energy storage
- Capacity building for business

39 Sectoral Roadmaps are defined for decarbonisation and aligned with related policies:

- Digital transition & skills
- Financing mechanisms
- R&D&I projects
- Environment

In the Decarbonised industry, strong attention is paid to:

- Cement: 5 C approach (very active federation)
- Renewable gases: introduction of renewable gases in the industry
- Metallurgy for the decarbonisation of the metal and electromechanical sector
- Petrochemical & chemical: based on CEFIC roadmap
- Glass packaging
- Paper & cardboard
- Casting industry

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This thematic report has been prepared in the context of the Mutual Learning Exercise (MLE) on Industrial Decarbonisation involving 12 committed participating countries. This second thematic report focuses on exploring the building blocks constituting a policy-mix for the effective uptake and deployment of low-carbon technologies. In particular, it focuses on the design and potential impact of national support programmes and initiatives, as well as support for industrial decarbonisation and demonstration projects under the Recovery and Resilience Facility, state aid programs and regulatory framework, Small and Medium-sized Enterprise support programmes, European Regional Development Fund, among others. It also explores and discusses various financing instruments as well as the mobilisation of public and private research and innovation investments for climate neutrality (e.g., investment pipelines, First-Of-A-Kind installations, and Important Projects of Common European Interest).

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