European Commission

Climate neutral market opportunities and EU competitiveness

Executive Summary

Written by ICF and Cleantech Group
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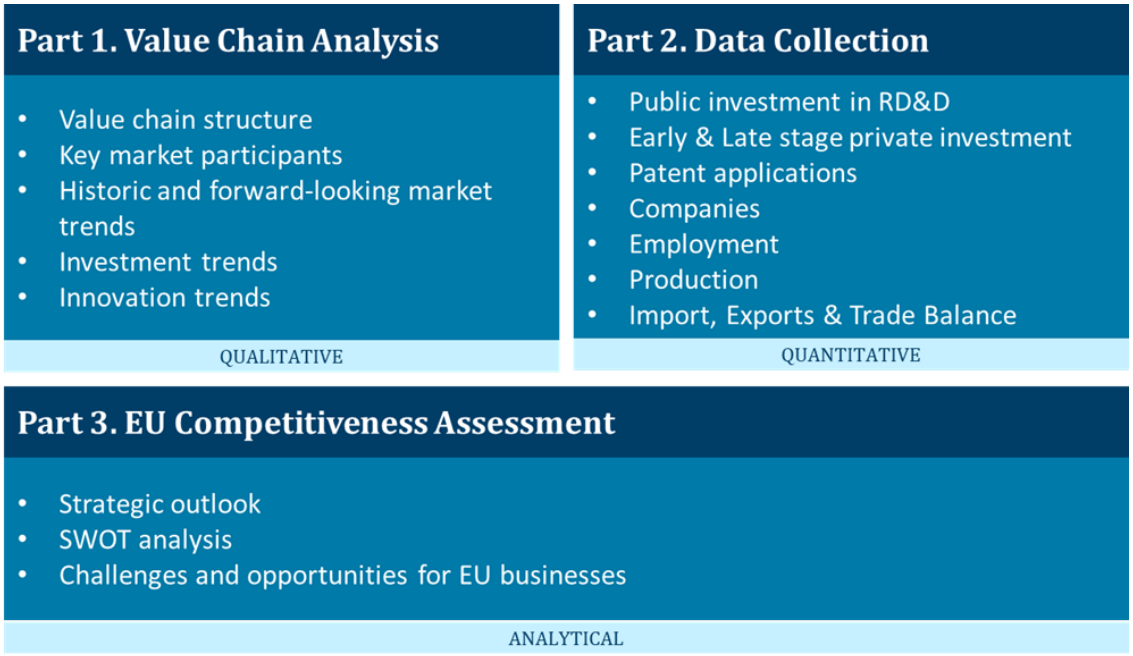
CONTENTS

Executive Summary

This study has assessed the competitiveness of European[1] businesses within the global value chains of key strategic components of climate neutral solutions. Using 12 value chains as a basis for the assessment, it has identified where these can enable European companies to gain additional comparative advantage while helping the EU to achieve its climate neutrality ambitions.

The results of this study include: (i) a replicable Competitiveness Assessment Framework (CAF), as illustrated in Figure 0.1, that serves as a basis for assessing the competitiveness of the EU in global climate neutral value chains; (ii) a dataset and a strategic outlook for each of the 12 value chains analysed; and, (iii) key conclusions drawn from applying the CAF to all value chains, covering the main drivers and dynamics of climate neutral solutions in Europe. This includes a cross-comparison of the results for each value chain, together with key challenges and policy recommendations.

Figure 0.1 Competitiveness Assessment Framework (CAF)



Source: ICF, 2020

The CAF consists of three key elements:

- **Value Chain Analysis** – this entails a qualitative analysis of the strategic components which define the structure of the value chain. It identifies key market participants, looks into both historic and forward-looking market trends, maps investment flows and spots innovation trends within the value chain.
- **Data Collection** – this involves gathering quantitative data on key indicators from multiple sources (see Figure 0.2 below). These indicators inform both the current state of the market (e.g. imports, exports and production) and innovation aspects across the value chain (e.g. patent applications and RD&D investment).

[1] Throughout the report the "Europe" category includes all countries that are part of the European single market – which includes the 27 Member States of the European Union, Iceland, Norway, Lichtenstein, the UK and Switzerland – whenever data is available for them. Whenever data is limited to the EU-28 or EU-27 this is clearly indicated.

- **European Competitiveness Assessment** – this consists of using the results from the Value Chain Analysis and Data Collection to inform a strategic outlook and Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis of the value chain. It also entails mapping key challenges and opportunities for European businesses and suggesting actions which can bring about a positive impact for the competitiveness of the EU.

Figure 0.2 Key indicators and judgement criteria underpinning the CAF

	#	Quantitative indicator	Source	Judgement Criteria
Innovation and Future Market Trends	1	Public RD&D investment	IEA	Is the value chain benefiting from sustained and/or growing levels of RD&D investment from the public sector?
	2	Early stage private investment (Venture Capital)	CTG	Does the market recognise the potential for this value chain to invest in innovation and generate financial returns?
	3	Late stage private investment (Venture Capital)	CTG	
	4	Patent applications	PATSTAT	Is the value chain effectively translating investment into tangible IP?
	5	Companies	CTG	Do European value chains comprise of leading innovative firms in the global value chain? Are European firms achieving the market recognition to enable them to build market share?
Current Market Trends	6	Employment	EurObserver	Does the value chain have an established labour market or is it emerging? Is it expanding or contracting?
	7	Production	PRODCOM	Is there core EU28 production competence and capability in key parts of the value chain? Which Member States have the most significant production?
	8	Turnover	EurObserver	What is the significance of EU28 firm level turnover across the value chain? Which parts of the value chain demonstrate the largest sales?
	9	Imports & Exports	PRODCOM, COMTRADE	Is the EU28 generating strong exports into non-EU28 countries? What is the long-term trend in exports?
	10	Trade Balance	PRODCOM, COMEXT	Is the EU28 able to sustain a strong and positive trade balance?

Source: ICF, 2020

To develop a set of indicators that could be used to assess EU competitiveness within global climate neutral value chains, a thorough review of literature and available datasets was undertaken and findings were discussed with the European Commission (EC), who have conducted extensive research of their own in this area[2]. Although the indicator set presented in Figure 0.2 is not extensive, it does cover multiple aspects of competitiveness which, when consolidated, allows for a robust and meaningful overview of the EU competitive position within a specific climate neutral value chain, compared to other countries and regions. It is important to stress that this study does not include an assessment of barriers to deploy climate neutral solutions, nor does it deal with affordability of costs in scaling up technologies towards market uptake.

Since a key objective of this study was to explore a new methodology for assessing competitiveness, key recommendations for addressing the challenges and limitations associated with implementing the CAF are summarised in Table 0.1.

[2] Asensio Bermejo, J.M. and Georgakaki, A., 2020, *Competitiveness indicators for low-carbon energy industries*, EUR 30404 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-23345-9 (online), doi:10.2760/43258, JRC116838. Available at: https://op.europa.eu/en/publication-detail/-/publication/29158e35-1411-11eb-b57e-01aa75ed71a1/language-en

Table 0.1 Recommendations for addressing the limitations of the CAF

Limitation of the CAF		Recommendations to resolve issue
Technological Coverage	Technological coverage is not aligned across the different indicators within a given value chain. The specific coverage and product definitions do not necessarily match across the different sources.	This misalignment does not compromise either the overview provided by the datasets or the CAF. However, it is essential to give sufficient consideration to the technological coverage when applying the CAF to a given value chain and to adequately disclose these limitations.
Geographic Coverage	Geographic coverage is not aligned across the different indicators within a given value chain. For some indicators, the data is available for all countries - i.e. EU and the Rest of the World (RoW) - and in others for only a selection of countries (e.g. EU28 Member States, IEA members). Furthermore, some countries keep their data confidential in some databases for one or multiple years.	Due to these limitations, for some indicators, it is not possible to compare Europe with RoW. This misalignment does not compromise the overview provided by either the datasets or the CAF. However, it is essential to consider the geographic coverage when applying the CAF to a given value chain and to adequately disclose any limitations.
Data gaps	Some technologies are not covered by some of the databases used in this study. For example, there is very limited data coverage of employment and turnover in climate neutral value chains.	Where data is not available for specific indicators, additional literature review and expert judgment should be used to complete the SWOT analyses and to inform the strategic outlooks.

Source: ICF, 2020

In recent years, several studies on the EU competitiveness of what could be considered climate neutral value chains have been conducted. The selection of the value chains analysed in this study took account of prior analysis and was informed by discussions with the Steering Committee (SC), recognising the EC's priorities for this study, particularly in light of the European Green Deal. To help operationalise the CAF in the context of the EU climate neutral policy objectives, the selected value chains were grouped into four major thematic areas (Table 0.2).

Table 0.2 Overview of the value chains selected for detailed analysis

Thematic areas	Value Chains
Mobility	• Batteries • Hydrogen Fuel Cells • Electric Power Trains • Electric Vehicles Charging Infrastructure
Buildings	• Prefabricated Buildings • Superinsulation Materials • Heat Pumps
Clean Power	• Wind Rotors • Photovoltaic Solar Panels
Integrators	• Building Energy Management Systems • Grid Energy Management Systems • Hydrogen Production

Source: ICF, 2020

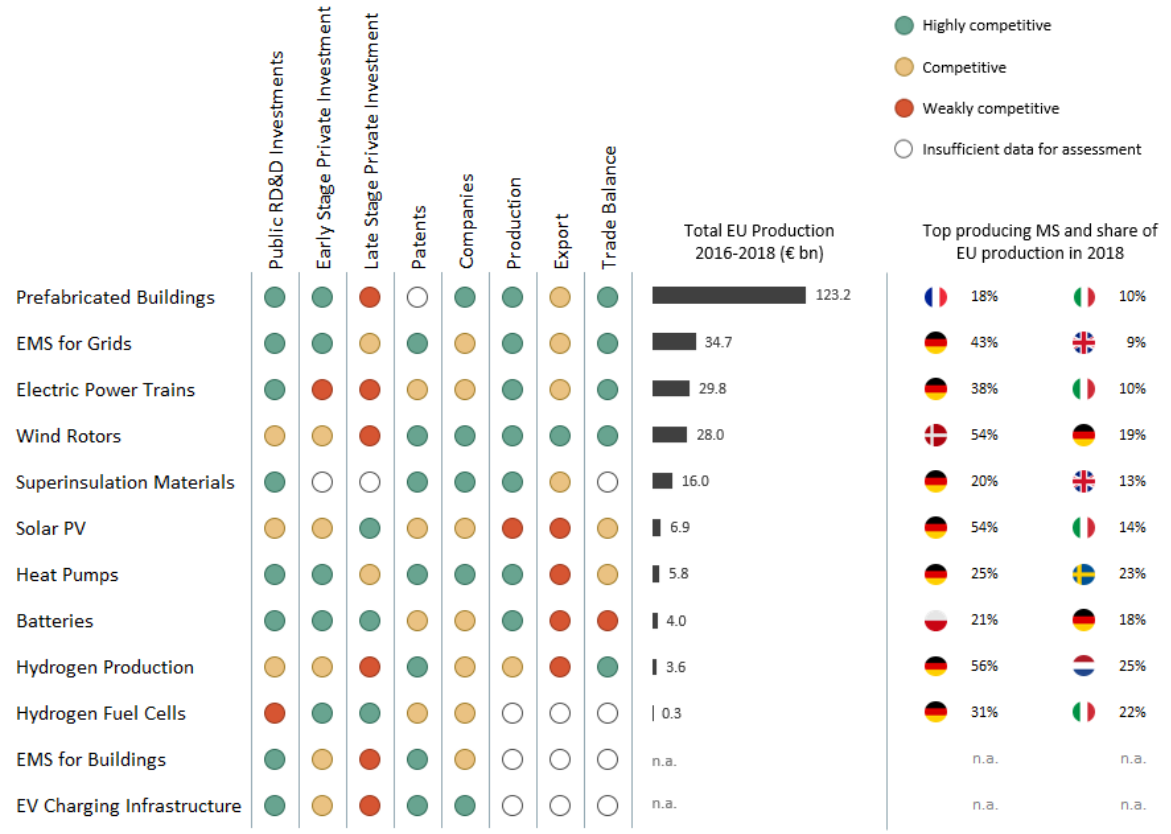
Figure 0.3 below summarises the key conclusions drawn from applying the CAF to the 12 climate neutral value chains and comparing results across them. Based on this assessment, the main drivers, dynamics and trends regarding EU competitiveness were identified. This summary is based on the results of the data collection undertaken within Part 2 of the CAF. It illustrates: (i) how competitive a value chain is based on each of the indicators; (ii) the

size of EU-28 production; and, (iii) the top producing Member States and their share of total EU-28 production in 2018.

For those indicators included in the summary, the judgement criteria for assessing competitiveness is based either on thresholds for the EU-28 or European share of global totals, or else on how the data has changed over the past years (i.e. increased, decreased or remained stable).

The summary does not include a cross-value chain assessment of employment and turnover, since the data on these indicators was only available for four out of the 12 value chains.

Figure 0.3 Summary findings across the 12 assessed value chains for selected indicators



Source: ICF, 2020

EU-28 production between 2016 and 2018 was aggregated to compare the order of magnitude across value chains. Although the Prefabricated Buildings value chain presents the highest production level, the data codes used in the analysis are not specific to low-carbon solutions, meaning that this total also includes traditional building products. This methodological issue also relates to Hydrogen Production, where the data codes do not differentiate between 'grey' and 'clean' hydrogen and therefore fail to illustrate that current clean hydrogen production in the EU-28 is still at a very small scale. Thus, the largest EU-28 climate neutral value chains of the 12 analysed are Grids Energy Management Systems, Electric Power Trains and Wind Rotors. The production of Photovoltaic Solar Panels (Solar PV) has decreased in the EU-28. Production in all other value chains for which data was available has grown over the period. Germany was the top producing EU-28 Member State in 7 out of the 10 value chains in 2018.

Public RD&D Investments have increased between 2009 and 2018 across most of the 12 value chains. The exceptions are Wind Rotors, Solar PV and Hydrogen Production – for which investments remained mostly stable – and Hydrogen Fuel Cells – where investments decreased. This may be due to the fact that these value chains are more established and public RD&D investments in them have already been at high levels.

The Private Investment data focuses on venture capital only and it covers mostly North America and Europe, since this is where there have traditionally been the largest venture capital investment flows. Across most value chains, the share of European investments is higher for early stage than for late stage (with Solar PV and Hydrogen Fuel Cells being the exceptions). This suggests that Series B+ investments[3] in European companies focused on low carbon technologies can potentially be expanded to strengthen EU competitiveness.

To put these trends in a wider perspective, European investments in seed, series A, series B, and growth equity rounds of energy and power companies grew at a rate of nearly 19% from 2015 to 2020, and totalled EUR 1.8 billion in 2019, comprising 44% of global investments into the sector, versus an average of 20% in the previous four years. Likewise, investments at the seed through growth equity stages in transportation and mobility in Europe grew in the same period at a rate of 28% to total nearly EUR 2.8 billion in 2019, 10% of global investments in the sector (and 11% through Q3 2020).[4]

With regards to patents, results indicate that Europe is highly competitive in more than half of the value chains analysed and weakly competitive in none, suggesting that Europe is a leading region for patent applications around climate neutral solutions globally. The European share of global high-value patent applications between 2014 and 2016 ranged between 15% for Hydrogen Fuel Cells and 63% for Wind Rotors.

Competitiveness in companies is based on the share of European companies included in the Cleantech Group database, which covers mostly innovative companies, but also, to a certain extent, more established market players. Based on this indicator, the results indicate that the EU competitiveness is average in more than half of the value chains and weak in none. The share of European companies ranges between 25% for Hydrogen Production and 59% for Heat Pumps.

With regards to exports, competitiveness is gauged by the share of EU-28 exports over total global exports between 2016 and 2018. The EU-28 is highly competitive only in the Wind Rotors value chain, where it dominates the global market with 39% of exports.

With respect to balance of trade, a value chain was classified as highly competitive where the EU-28 has a positive trade balance that has been improving between 2009 and 2018: a value chain was deemed to be weakly competitive where the converse was true. Five of the eight value chains were assessed as highly competitive, including Grids EMS, Electric Power Trains and Wind Rotors. The competitiveness of the Solar PV value chain was assessed as medium because the EU-28 trade balance is negative, although it has shown some improvement in the period. Likewise, the Heat Pumps value chain competitiveness was assessed as medium because the EU-28 trade balance is positive however it has been deteriorating over time.

Based on the assessment of the EU competitiveness across the 12 value, key market trends across climate neutral solutions were identified together with cross-cutting challenges, such

[3] Series B financing is the second round of funding for a business through investment, including private equity investors and venture capitalists. The Series B round generally takes place when the company has accomplished certain milestones in developing its business and is past the initial startup stage. Source: Investopedia.

[4] Cleantech Group, 2020, i3 database. Conversion from USD to EUR based on https://xe.com.

as the lack of European-wide RD&D cooperative frameworks and limited end-of-life and recycling opportunities for some climate neutral solutions. Ten recommendations were identified to address the transversal challenges identified and contribute to enhancing the competitiveness position of the EU along the 12 analysed value chains.

Table 0.3 Policy Recommendations

R1	Use competitiveness assessments to identify VC segments of strategic importance for the EU economy and the transition to climate neutrality, to inform the design of strategic plans and calls for proposals; and, where necessary, create or enhance dedicated funding 'windows' within investment programmes and mechanisms to ensure sufficient support across the innovation cycle.
R2	Review the current European Strategic Cluster Partnerships, and overarching EU clustering strategy, to determine whether it remains fit-for-purpose and able to support VCs of key importance to achieve climate neutrality by 2050.
R3	Maximise the opportunities offered by public financial instruments deployed in recent years (e.g. EIF equity investments, InnovFin Energy Demo Projects facility, etc.) to increase the flow of private finance towards climate neutral solutions, at the scale-up and commercialisation stage (i.e. venture capital and private equity) as well as around main market deployment.
R4	Reduce the dependency of critical raw materials for innovative climate neutral solutions through increased focus on exploiting the EU own sources, developing the recycling sector and circular economy in line with the Action Plan on Critical Raw Materials.
R5	Build on the experience gained through establishment of the European Battery Alliance and the European Clean Hydrogen Alliance to adopt a more formal process to set-up coordinated sectoral strategies at EU level aimed at reinforcing the competitiveness of the EU in different industrial ecosystems. Adopting a stronger sectoral focus will require more intensive inter-service collaboration across the EC and the involvement of key stakeholders.
R6	Develop EU export strategies for key climate neutral solutions, building on existing initiatives and networks.
R7	Support standardisation of climate neutral solutions in the EU and beyond to ensure interoperability, facilitate the deployment of new technologies across the EU and simplify market adoption of leading innovations in the internal single market and across global markets.
R8	Exploit further the NECP progress reports, EU Semester process and Member State Recovery and Resilience Plans to coordinate: (1) public investments towards climate neutral solutions across Europe; (2) the development of appropriate infrastructure to support the transition towards climate neutrality; (3) the contribution of national innovation/industrial ecosystems to the building of European strategic and climate neutral VCs; and (4) the contribution of Member State policies to both the European RD&D and EU competitiveness objectives, while achieving the EU climate ambition.
R9	Reinforce the European low carbon energy market by: (1) further strengthening the transposition mechanisms at hand and ensuring that adopted European energy and climate legislation is correctly introduced on time into national laws; (2) coordinating large low-carbon infrastructure auctions (including RES) between Member States to enable a timely and scheduled connection of large projects and the respective enabling infrastructure to the grid; (3) increase interconnection between countries to at least 15% and ensure that barrier-free and easier trade of RES across Europe is possible and stimulated
R10	Develop strong demand-side policies to drive market developments in the EU and benefit from the first-mover advantage in innovative climate neutral VCs. Demand-side policies must complement the set of existing policies and measures in place to support the competitiveness of EU businesses developing climate neutral solutions. Creating demand and markets for clean, climate-neutral, energy-efficient and circular products is critical to ensure the EU can achieve its climate neutrality objectives.

Source: ICF, 2020

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