Market analysis of timber products and ecosystem services

Deliverable 3.2

Co-funded by the European Union

Project Name: LIFE23-CCM-ES-WOOD4LIFE
Project Acronym: WOOD4LIFE
Project Grant Agreement number: 101156491

Working Package 3: Preparatory activities
Task 3.2 Characterisation of supply chain of wood-based products.
Sub-task:3.2.3: Market analysis

Dissemination level: Public

Document authors and contacts:

Nicola Andrighetto, Etifor | Valuing Nature
Elena Massarenti, Etifor | Valuing Nature
Giulia Cecchinato, Etifor | Valuing Nature
Martina Doppio, Etifor | Valuing Nature

Document version/status: draft

Date: 26/08/2025

Acknowledgements
The authors would like to thank Conlegno, FSC Spain, and Lignum Tech for their collaboration in the design and promotion of the questionnaire.
Gratitude is also extended to all the companies that participated in the survey.wood4life.castillalamancha.es

WOOD4LIFE is a European project that promotes sustainable forest management and the use of long-lasting wood products as a climate change mitigation strategy. Through technological innovation, interregional collaboration, and a strong commitment to local areas, the project aims to reactivate the forest value chain in Castilla-La Mancha (Spain) and the Tuscan-Emilian Apennines (Italy), generating green jobs, conserving biodiversity, and storing carbon in durable wood products. WOOD4LIFE represents a replicable model for a low-carbon economy, aligned with the EU strategy on carbon farming and rural resilience.

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

INDEX

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This document, entitled *"Market Analysis of Timber Products and Ecosystem Services"*, represents Deliverable No. 3.2 of the WOOD4LIFE Project. The deliverable has been developed by Etifor | Valuing Nature, with the collaboration of all partners involved in Task 3.2, in particular Conlegno, FSC Spain, and Lignum Tech. The main objective of the document is to present the results of the survey carried out in spring 2025 to assess whether stakeholders in the timber value chain in Spain and Italy are willing to pay a price premium for wood products in recognition of the environmental benefits they provide, also in light of the forthcoming entry into force of the Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012). This regulation aims to establish the first EU-wide voluntary certification framework designed to promote high-quality carbon removal activities, including those aimed at storing carbon in timber products.

The survey was based on a questionnaire consisting of 22 questions, answered by 156 companies. The results highlighted that: (i) awareness of the CRCF Regulation among actors in the Italian and Spanish timber sectors is still rather low; (ii) companies rarely communicate the environmental benefits of wood use, such as its contribution to carbon storage; (iii) there is a widespread perception that consumers are not fully aware of the environmental benefits of using wood, including in construction; and (iv) according to actors' of timber sector, existing forest certification schemes, such as FSC and PEFC, should play an important role in future certification systems designed to quantify the carbon stored in products.

Given these findings, there is an evident and pressing need to launch communication campaigns aimed at raising consumer awareness of the benefits of using wood, as well as initiatives targeting companies in the sector to ensure they are properly informed and aware of the objectives of European Regulations, such as the CRCF Regulation. These initiatives should involve the various national trade associations, as well as the existing forest certification schemes, given their significant recognition in the market.

1. INTRODUCTION

1.1 The role of harvested wood products in climate change mitigation

Recent scientific assessments confirm that climate change is progressing at an unprecedented rate. Global surface temperatures have risen by approximately 1.1 °C above pre-industrial levels during 2011–2020 (IPCC, 2023). More concerningly, 2023 was the warmest year on record, with the global average near-surface temperature reaching 1.45 °C above pre-industrial level (World Meteorological Organization, 2024). These temperature increases have triggered more frequent and intense heatwaves, droughts, heavy precipitation, and sea level rise, all of which are already adversely impacting ecosystems and human societies globally (UNEP, 2025).

According to the United Nations[1] climate change represents the most significant challenge facing humanity in the 21st century, an issue that has dominated political agendas and driven international policy and governance over the past two decades

The increasing concentration of greenhouse gases (GHGs) in the atmosphere, particularly carbon dioxide (CO_2), is recognized as one of the most significant drivers of climate change (IPCC, 2023). According to NOAA Global Monitoring Laboratory[2], since the late 19th century, atmospheric CO_2 concentrations have increased from around 280 ppm to almost 430 ppm in 2025, reaching levels unprecedented in at least the past 800,000 years. This sharp rise is primarily attributable to human activities, including the burning of fossil fuels, deforestation, and industrial processes (IPCC, 2021).

Policies and initiatives to reduce atmospheric CO_2 concentrations are therefore essential, and among these, those related to the forestry sector, its management and its products, can play a key role. The forestry sector is, in fact, central to the ongoing transition toward a low-carbon, circular economy. Forests represent one of the largest sinks for atmospheric CO_2, while also providing multiple ecosystem services, including biodiversity conservation, soil and water protection, and the provision of renewable resources (FAO, 2020a).

Regarding the role of forests as carbon stocks, afforestation and forest restoration have the potential to significantly enhance removals in both biomass and soil, while sustainably managed forests sequester more carbon than unmanaged forests, as documented by numerous scientific studies (IPCC, 2019).

Moreover, wood-based materials, as substitutes for fossil-intensive products, represent one of the most effective strategies for long-term climate change mitigation (Grassi et al., 2021). For example, replacing conventional building materials with mass timber can reduce construction-phase emissions by up to 69%, corresponding to an average reduction of 216 kg CO_2eq per square meter of floor area.

[1] United nations website available at the following link: https://www.un.org/en/global-issues/climate-change
[2] Website of NOAA Global Monitoring Laboratory available at the following link: https://gml.noaa.gov/ccgg/trends/

Given the significant weight of the construction sector in global emissions, responsible for around 40% of annual CO_2-equivalent emissions, scaling up low-carbon construction by assuming that mass timber substitutes for conventional materials in half of projected new urban construction could mitigate as much as 9% of global emissions (Himes and Busby, 2020).

This climate benefit of wood is further amplified through cascading uses, energy-efficient processing, and the eventual role of wood residues as a carbon-neutral energy source at the end of their service life (FAO, 2020b). Moreover, wood construction can also limit the weight of the structure and therefore the size of foundations, material use and therefore associated emissions are also reduced (Timber Perception Lab, 2023). Beyond climate change mitigation, the increased use of wood-based products can provide additional economic, environmental, and social benefits (Reid et al., 2004).

For these reasons, the European Unions has elected wood as the main material for the future. Confirming this direction, several legislative initiatives at the European level, such as the Renovation Wave Strategy[3] and the New European Bauhaus initiative[4], are actively promoting the use of wood in the building sector. Further confirmation came from the President of the Europea Commission Ursula von der Leyen, who, in her State of the Union addressed at the European Parliament in Strasbourg in September 2020, emphasized that the construction sector could be transformed *"from a carbon source into a carbon sink" through the use of organic materials such as wood*[5].

Despite the increasing global production of industrial roundwood since 1961, in order to further stimulate and ensure transparency in businesses and markets associated with the production and trade of sustainably sourced wood products, it is necessary to improve the quantification of the future role of wood as a carbon stock. Among the main challenges that often complicate this quantification of carbon stored in timber products are: (a) uncertainties associated with end-of-life pathways, (b) methodological differences in estimating carbon storage, and (c) variability in input data, such as conversion factors and product lifetimes. (FAO, 2020b)

The need for greater transparency is urgent not only for the carbon stored in timber products but also more generally across the ecosystem services sector, in light of the growing number of voluntary initiatives designed to monetize such services (Pettenella et al., 2023). Specifically, in the voluntary carbon market, which includes projects generating carbon credits from nature-based solutions such as afforestation and improved forest management, as well as technological interventions like biochar production and engineered carbon removals, is essential to ensure credibility through robust methodologies, third-party standards, and registries that safeguard environmental integrity and minimize risks of greenwashing. This issue is particularly relevant considering that the credibility of forest-based carbon markets has recently

[3] Details of Renovation Wave strategy is available at: https://energy.ec.europa.eu/topics/energy-efficiency/energy-performance-buildings/renovation-wave_en
[4] Details of New European Bauhaus (NEB) is available at: https://new-european-bauhaus.europa.eu/index_en
[5] A summary of this speech by Ursula von der Leyen is available at: https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655

been called into question by several studies, such as those reported by *The Guardian*[6], which have provoked considerable debate and concern within civil society. The main issues concern the additionality, permanence, and overall effectiveness of certain forestry offset projects, raising concerns about overestimated climate benefits.

To ensure transparency in the voluntary carbon market, at the end of 2024 the EU Commission published the Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012).

1.2 The Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012)

The main goal of the Regulation

Published in the Official Journal of the EU on 6 December 2024, the Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012) aims to introduce the first EU-wide voluntary certification framework designed to promote high-quality carbon removal activities. In detail, the Regulation aims to establish a voluntary, EU-wide certification framework designed to promote environmental integrity, trust and comparability in the quantification and verification of carbon removals and soil emission reductions. In fact, it aims to provides a harmonised system of quality criteria, certification methodologies, and rules for the functioning and recognition of certification schemes applicable to a wide variety of removal activities across the EU. This Regulation is designed to complement ongoing emission reduction efforts across all sectors and directly supports the European Union's legally binding objective of achieving climate neutrality by 2050, as established in Regulation (EU) 2021/1119 (the European Climate Law), which reaffirms the EU's strong commitment to the goals of the Paris Agreement. The CRCF Regulation also aims to provide important elements to ensure transparency in other initiatives, such as the Green Claims Directive and the Corporate Sustainability Reporting Directive (CSRD), thereby contributing to the prevention of greenwashing**.**

The activities included in the scope of Regulation

The scope of the CRCF Regulation is limited to activities carried out within the territory of the European Union that generate measurable net climate benefits. Specifically, the eligible activities covered by the Regulation fall into four categories:

- **Permanent carbon removals**: practices that store atmospheric or biogenic CO_2 for several centuries, including geological storage and chemically bound carbon in products. These types of removals are mainly based on DACCS and BECCS technologies.
- **Carbon removals through carbon farming**: land-based or coastal practices over at least five years that temporarily store carbon in biogenic pools or reduce emissions from soils. This category includes activities related to the agricultural and forestry sectors

[6] Study reported by The Guardian is available at: https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe

- **Carbon storage in long-lasting products**: storage of carbon for at least 35 years in timber durable materials, that should be subject to on-site monitoring and certification. This category includes activities related building sector.

The following *Figure 1* summarises the activities included in the scope of the CRCF Regulation:

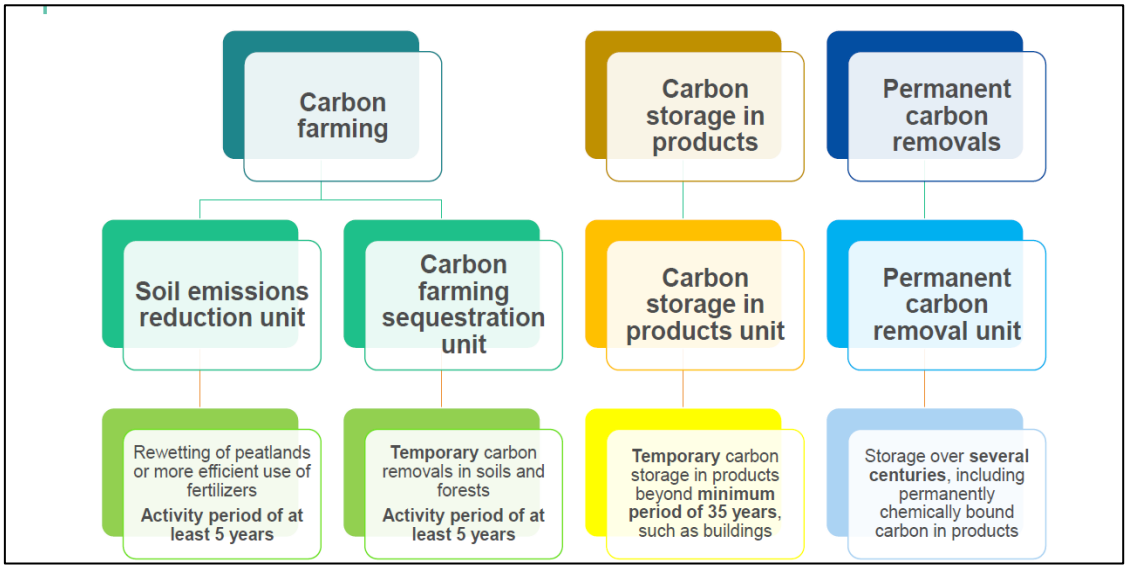

Figure 1. Activities included in the scope of certification according to the CRCF Regulation. Source: 5th Expert Group Meeting on Carbon Removals

Despite the different sectors involved, the required quality criteria and certification processes are the same for all four of the aforementioned categories.

The quality criteria

To guarantee transparency and credibility throughout the process, carbon removals should be based on compliance with the following four core quality criteria:

- **Quantification:** Accurate, complete, conservative and transparent measurement of net carbon removal or soil emission reduction benefits. The net carbon removals benefit shall be quantified using the following formula: *NET BENEFIT: Carbon Removals (baseline) – Carbon Removals linked to the activity (total) – GHG associated >0*
- **Additionality:** Demonstration that the certified activity goes beyond existing legal obligations and would not have occurred without the incentive effect of certification.
- **Storage, monitoring and liability:** Evidence that carbon is stored over a relevant monitoring period (including permanent or time-limited storage), with appropriate monitoring rules, risk mitigation measures, and liability mechanisms in place to address potential carbon reversal.
- **Sustainability:** Compliance with minimum environmental and social safeguards, including the "*do no significant harm*" principle, biodiversity

protection, soil and ecosystem health, and the sustainable use of natural resources.

The certification process

The certification process for carbon removal units, as established by the Regulation, is based on independent third-party verification and includes both initial certification audits and periodic re-certification audits to ensure ongoing compliance with regulatory criteria. Once validated, certified operators are issued Certified Units (CUs), which are traceable, non-fungible, and recorded either in interoperable registries or in the Union Registry, the latter becoming operational in 2028.

In addition to operators, who are the main actors responsible for implementing carbon removal activities, the other key stakeholders involved in the certification process are: (i) certification schemes (public or private), (ii) certification bodies, which are accredited and supervised by Member States and National Accreditation Bodies, (iii) the European Commission, which plays a coordinating role, and (iv) buyers, who can use certified units to support climate-related claims or to comply with future regulatory obligations. Figure 2. briefly summarizes the certification process and key actors.

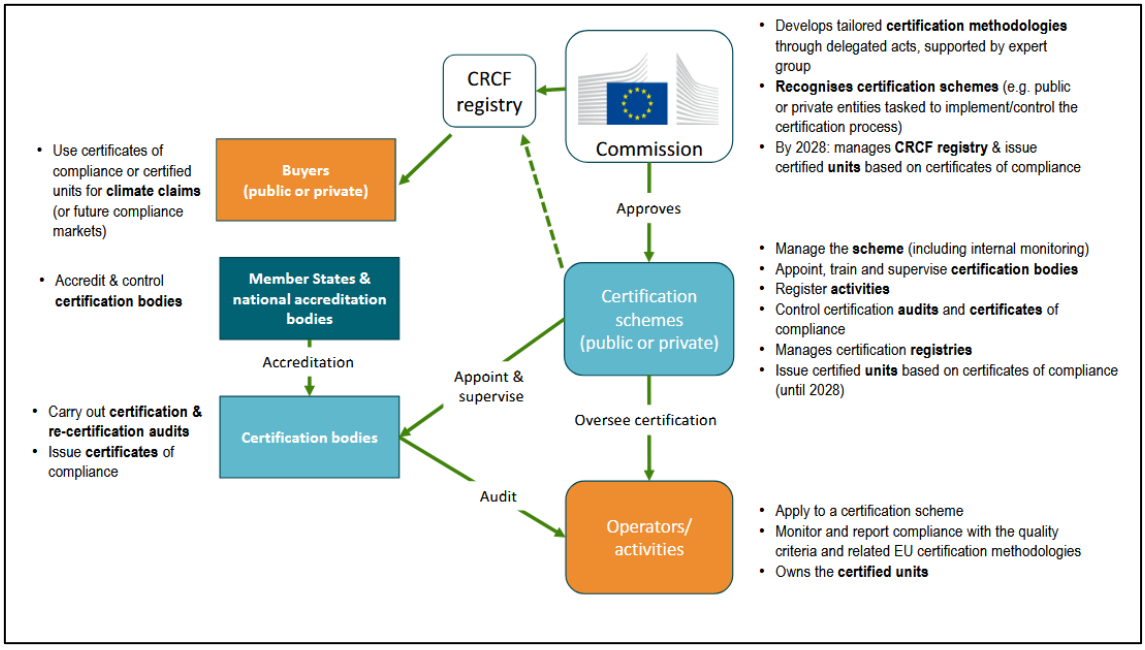

Figure 2. CRCF certification process and key actors. Source: 5th Carbon removals expert group meeting.

Timeline and next steps for CRCF implementation

Following its publication in the Official Journal of the EU in December 2024, the CRCF Regulation entered a multi-phase implementation process aimed at developing, validating, and operationalizing certification methodologies. This process, largely based on participatory approaches such as workshops and expert group meetings, was launched at the end of 2024 and is concluding in these months (spring–summer 2025). In the second part of 2025, the European Commission is expected to present its proposals for delegated acts on certification methodologies (developed with the support

of the CRCF Expert Group), as well as an implementing act on verification rules and the establishment of the registry. The operational phase of certification is therefore expected to begin in 2026, with the recognition of certification schemes and the first issuance of certified units anticipated in the second half of the year. Looking further ahead, the EU-wide digital registry, which will support transparency and traceability of certified units, is scheduled to become operational in 2028.

Carbon storage in long-lasting products

As mentioned, numerous legislative initiatives at the European level are promoting the use of wood in the construction sector, given its capacity to store carbon and to enhance other ecosystem services. However, in its Carbon Cycle Communication of December 2021[7], while recognizing the environmental benefits of using domestically sourced wood, the European Commission also highlighted the need to develop coherent methodologies for certifying carbon storage, based on scientific measurement methodologies

Consistent with what was set out in this communication, activities aimed at storing carbon in products have been included within the scope of the CRCF Regulation. In particular, this Regulation defines carbon storage in products as any practice or process that captures and stores atmospheric or biogenic carbon for at least 35 years in long-lasting products, with on-site monitoring of the stored carbon throughout the certification period. Units of carbon storage in products are tied to an expiry date corresponding to the end of the monitoring period: after this date, the stored carbon is assumed to be released into the atmosphere unless the operator (or group of operators) commits to extending the monitoring.

To avoid unwanted burden-shifting and rebound effects, minimum sustainability requirements will be established for projects, materials, and material sources. These will be based on methodologies and rules from existing EU initiatives such as the Renewable Energy Directive (RED III), and the EU Taxonomy for sustainable activities.

According to the outcomes of an expert meeting and related publications in the context of the CRCF Regulation, building owners will be designated as the liability carriers as well as the primary recipients of certified units. These units may be traded on the voluntary carbon market, used to report the carbon storage indicator in Energy Performance Certificates (EPCs) under the Energy Performance of Buildings Directive (EPBD), or employed to substantiate claims on carbon storage in line with the Corporate Sustainability Reporting Directive (CSRD).

In fact, with the revised EPBD allowing building owners to declare the carbon storage capacity of their structures on their EPCs, the CRCF certification methodology for carbon storage in products and related storage units provides reliable evidence to transparently demonstrate their buildings' carbon storage capacity.

[7] Communication available at the following link: https://climate.ec.europa.eu/system/files/2021-12/com_2021_800_en_0.pdf

2. THE MOTIVATIONS AND THE MAIN OBJECTIVE OF THE RESEARCH

As demonstrated, the role of wood as a fundamental element in combating climate change and enhancing other ecosystem services is now widely recognised in the scientific community. For this reason, at the European level, wood has been designated as the primary construction material of the future.

Consequently, an increasing number of legislative initiatives and policies, such as the New European Bauhaus initiative, are promoting in various ways the use of wood products within the building sector. To ensure transparency in the sector through the provision of reliable certifications grounded in scientifically validated methodologies, the CRCF Regulation has incorporated within its scope activities related to carbon storage in timber products. As highlighted previously, the main recipients and liability carriers of certifications relating to carbon storage are consumers, namely building owners who are not necessarily integrated into the wood construction sector.

In the coming months (early 2026), the certification process outlined in the CRCF Regulation is expected to become operational. It is therefore essential to understand whether companies in the wood sector, as well as consumers, are adequately prepared for the introduction of such certifications to the market.

Against this backdrop, the research seeks to investigate the level of awareness of the CRCF Regulation among companies of the forest sector, whether they are ready to promote certifications that quantify the carbon stored in products, and whether they are already familiar with methodologies for calculating emissions across their supply chains, as required under the regulation's framework. Beyond these aspects, companies were also asked to share their views on consumers' willingness to pay a premium for wood products, considering their significant contribution to the maintenance and enhancement of ecosystem services.

In addition, the research aims to explore whether existing certification schemes (such as FSC and PEFC) are regarded by companies as reliable tools for assessing ecosystem services, particularly carbon stored in products, and therefore useful for the certification of carbon storage. This is especially relevant given that forest certification schemes are themselves evolving in this direction, adapting their instruments, as illustrated by FSC's newly developed guideline *FSC-GUI-30-006a V2-0 EN*.

The companies surveyed were based in Spain and Italy, where the WOOD4LIFE partners are located and where its field activities will be carried out. The two countries display broadly similar characteristics in their respective wood supply chains. Both have relatively weak upstream segments, with the forest sector accounting for no more than 1.5% of total GDP, comparable levels of employment and apparent labour productivity in forestry, and a harvesting rate (around 30% of increment) considerably lower than the European average. On the other hand, Italy has a relatively well-developed secondary processing sector, with significant uptake of forest CoC certifications. (Eurostat, 2024).

Beyond the more operational aspects, this research also aims to address some of the existing gaps in the literature. To date, numerous studies (Paulus et al., 2021; Panico et al., 2022) have examined market perceptions of forest certification, while a smaller number of works, mainly focused on Nordic countries (Roos et al., 2023) or on economies strongly linked to the forestry sector (Petruch, 2021), have explored consumer awareness of the role of wood in carbon storage. In Spain and Italy only a very limited number of studies exist, such as the *Timber Perception Lab* (2023) on market perceptions of wood products, and no research has specifically investigated market recognition of wood's capacity to contribute to climate change mitigation, particularly in light of the forthcoming entry into force of the CRCF Regulation.

The findings of this research will provide valuable insights for policymakers, helping to identify the actions required to ensure the effective implementation of the CRCF Regulation, and to promote certifications capable of quantifying the impact of wood use on ecosystem services, especially carbon storage.

Furthermore, withing the framework of WOOD4LIFE, the results will support the proper implementation of the carbon tool envisaged in WP5, as well as the numerous activities of WP6, in particular the development of a marketing strategy for business models and the promotion of the protocol devised within WP5.

3. METHODOLOGY

As outlined, the primary objective of this research is to understand how actors within the timber value chain in Spain and Italy evaluate and promote the role of wood products while also monitoring their supply chains in relation to their capacity to generate positive impacts on ecosystem services, particularly their ability to store carbon. In parallel, the survey investigated companies' knowledge of the EU Carbon Removals and Carbon Farming Certification Regulation (CRCF), as well as their perceptions of the potential benefits and challenges associated with the certification of carbon stored in wood products, which will be a central element of the Regulation.

The analysis targeted companies rather than consumers, as companies not only have an informed understanding of consumer preferences but will also be directly involved in the principal steps of implementing the CRFC. Although they are not the main beneficiaries of the certification, companies are expected to play an active role in the related certification processes related to carbon storage in timber products.

The survey was conducted using a questionnaire, designed using Google Form, and developed by Etifor, with the support of Conlegno, FSC Spain, and Lignum Tech, partners of the WOOD4LIFE project and directly involved in the subtask 3.2.3, entitled "Market Analysis".

The questionnaire comprised 22 questions, structured as follows:

- **5 questions** profiling the company (e.g., name, respondent details, company activities);
- **5 questions** exploring the company's commitment to undertaking and communicating activities to improve sustainability, with a particular emphasis on the role of wood in carbon storage;
- **3 questions** assessing companies' perceptions of consumer awareness regarding the role of harvested wood products in carbon storage;
- **4 questions** investigating the level of knowledge of companies on the EU Carbon Removals and Carbon Farming Certification Regulation, together with their views on its potential impacts;
- **5 questions** examining whether respondents were aware of tools (such as certifications or inter-company agreements) that could facilitate compliance with the Regulation's requirements.

Most of the questions were closed-ended (in some cases allowing multiple answers, in others requiring a single choice), while only the company profiling questions being open-ended.

The questionnaire was distributed between May and July 2025 to companies within the Conlegno network for the Italian context, the FSC Spain network, and the contact of Lignum Tech (including suppliers and clients) for the Spanish context. The characteristics

of the Conlegno and FSC Spain networks, such as the strong presence of CoC-certified companies, should be taken into account when interpreting the results.

In total, 156 companies responded: 96 from Italy and 60 from Spain. As will be shown in the results chapter, the surveyed companies were generally willing to respond to all the questions, completing the questionnaire despite the absence of compulsory items and provided valuable insights regarding both consumers awareness of the role of timber as a carbon sink and other related aspects.

For the analysis of results, pie charts were employed for single-choice questions, while bar charts were employed for multiple-choice questions. In all charts presented below, the overall results are reported alongside a breakdown by national context (Spain and Italy). In two specific cases, results are further disaggregated to distinguish between companies certified under the FSC and PEFC (CoC) schemes.

4. RESULTS

4.1 Types of surveyed companies and their commitment to sustainability

In both the Spanish and Italian contexts, the activities of the 156 surveyed companies are quite diverse (Figure 3). Overall, the most common activities carried out by the respondents were: (i) wood packaging production (40%), (ii) production of wooden products for construction (25%), (iii) retail/distribution (16%) and (iv) sawnwood production (13%).

The strong representation of companies specialised in wood packaging, particularly among Italian respondents, where they accounted for more than 50% of the sample, can largely be explained by two factors: (i) many companies within the Conlegno network, which was the main promoter of the questionnaire in Italy, belong to FITOK system[8], and (ii) the wood packaging sector represents a significant industry in Italy, accounting for 17.5% of production by weight (Iascone, 2022) . It is also worth noting that the sample included a significant share of producers of sawnwood and wooden products for construction, activities that accounted for 40% of the Spanish companies surveyed. These sectors are especially relevant for this research, as they are closely and directly involved in the implementation of the CFRC Regulation

In terms of company size, 81% of respondents were SMEs, with very similar shares in Italy and Spain. No substantial differences were observed between SMEs and larger companies in the responses provided.

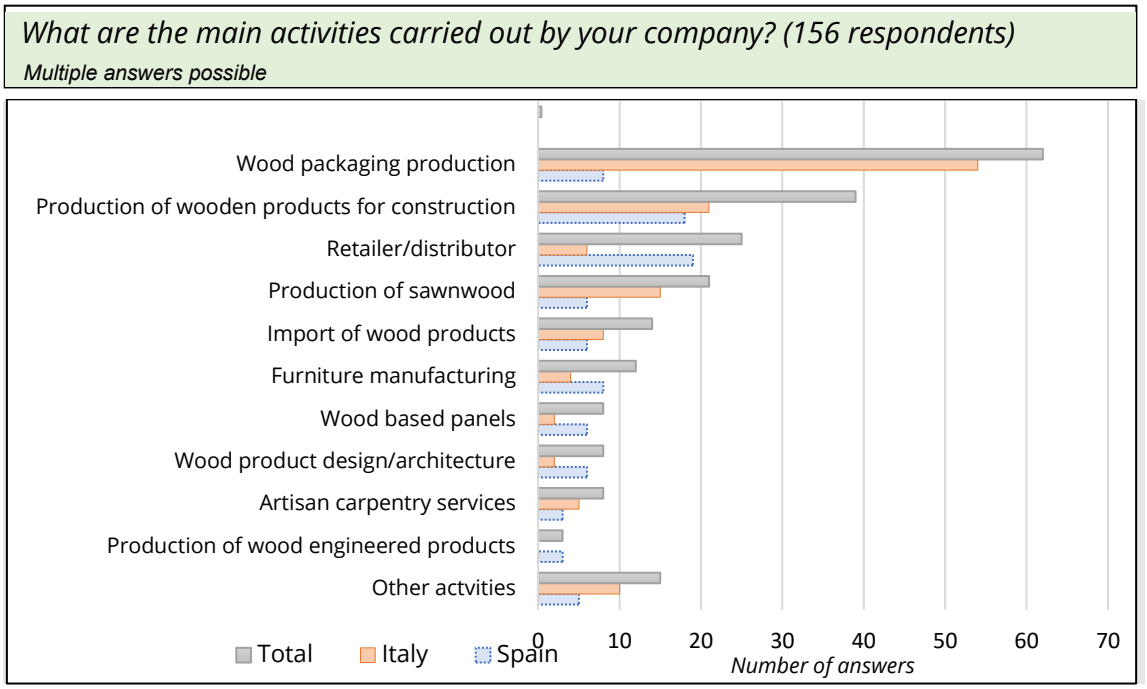

Figure 3. Main activities carried out by the interviewed companies

[8] Conlegno is also responsible in Italy for the FITOK certification, which certifies that wooden packaging used complies with the ISPM-15 rules (concerning phytosanitary regulations)

The majority of the surveyed companies hold at least one forest CoC certification. Overall, 76% reported having FSC or PEFC certification, or both. While in Italy almost 40% of the surveyed companies do not hold any certification, more than 90% in Spain are FSC certified (Figure 4). This strong presence of certified companies in the Spanish sample can largely be attributed to the fact that FSC Spain was the main promoter of the questionnaire.

Such a high share of certified companies is an important factor to consider when interpreting the results. Indeed, as certifications often indicate greater familiarity with the issued addressed in the questionnaire and a stronger sensitivity towards environmental concerns.

Is your company certified according to FSC or PEFC (CoC) standards? (156 respondents)
Only one answer possible

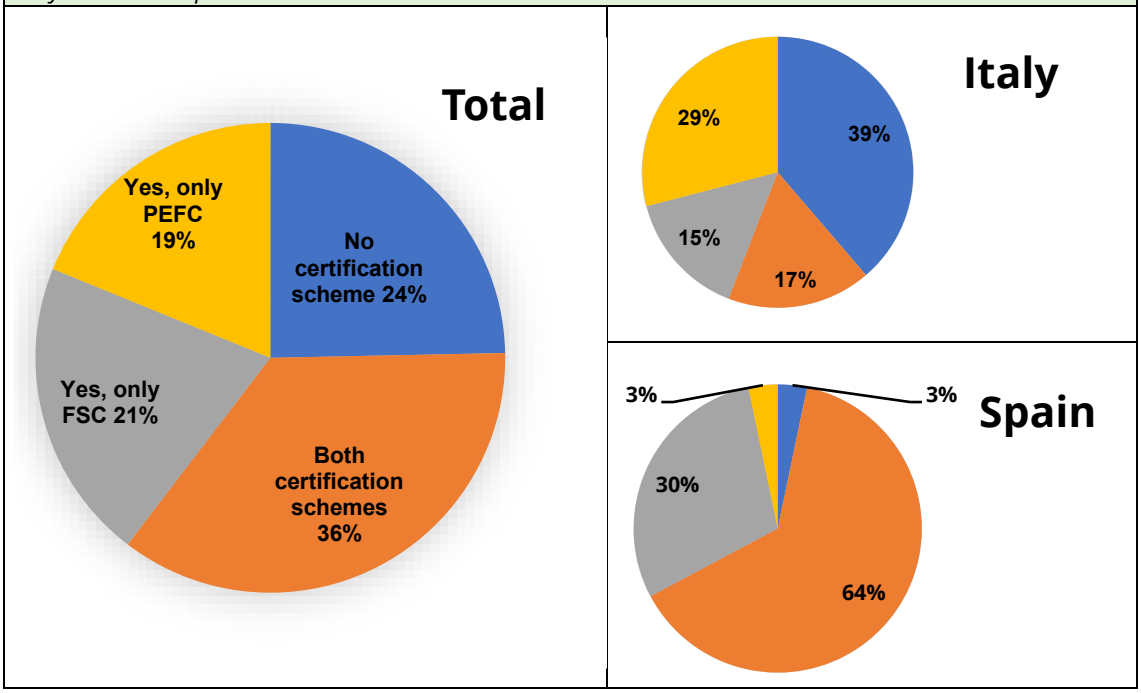

Figure 4. The adoption of FSC/PEFC CoC certification among the interviewed companies

Beyond CoC certifications, the questionnaire explored companies' commitment to identifying and monitoring potential impacts arising from their supply chains. These impacts are often indirect, yet companies can influence their reduction. In this regard, only 44% of respondents stated that they have procedures in place to monitor the impacts of their supply chains, and less than 40% reported that these procedures were effectively implemented (Figure 5).

Among non-certified companies, 85% reported to not currently have any policy in place, confirming that certification (FSC or PEFC), is associated with greater likelihood of adopting such measures. Encouragingly, half of the companies without policies stated their intentions to introduce them in the coming years, suggesting growing recognition of the importance of impacts reduction and supply chain monitoring.

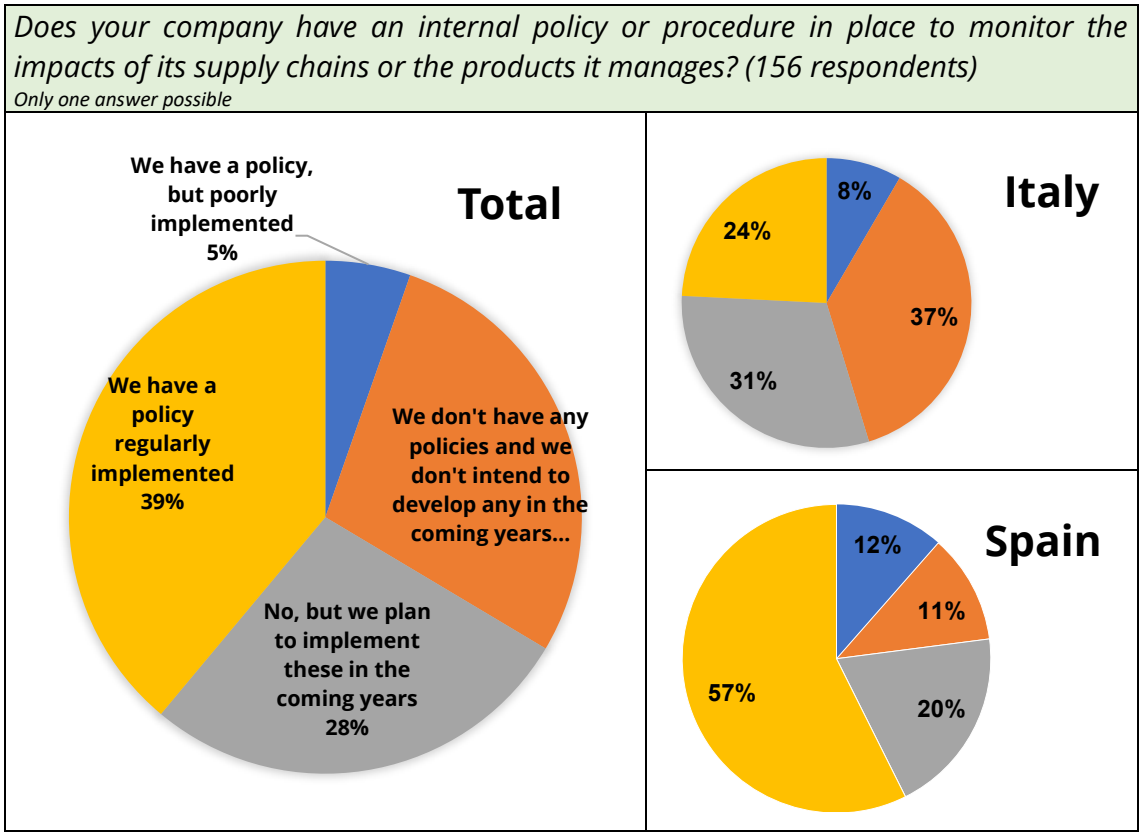

Figure 5. Percentage of interviewed companies that have implemented a policy or procedure for monitoring the impacts of their supply chains

Even fewer companies reported to conduct detailed environmental impact assessments, such as Life Cycle Assessments (LCA), product carbon footprints, or corporate carbon footprints. Only 30% indicated that they had carried out such analyses (Figure 6). Once again, the Spanish companies surveyed, probably because 90% are FSC certified, appear more inclined to perform such analyses. The main barriers to carrying out these analyses reported by companies include: (i) lack of financial or technical resources, (ii) lack of demand from the market, (iii) difficult in obtaining key data required to carry out the analyses, (iv) reluctance to request data suppliers. On the other hand, the main motivations driving companies to undertake these types of analyses are corporate strategies aimed at increasing sustainability and transparency in their supply chains. Customer demand, however, was mentioned as a driver by only a limited number of companies.

Has your company carried out or subcontracted specific analyses to assess the environmental impact of some of its supply chains, including the quantification of greenhouse gas emissions? (156 respondents)

Only one answer possible

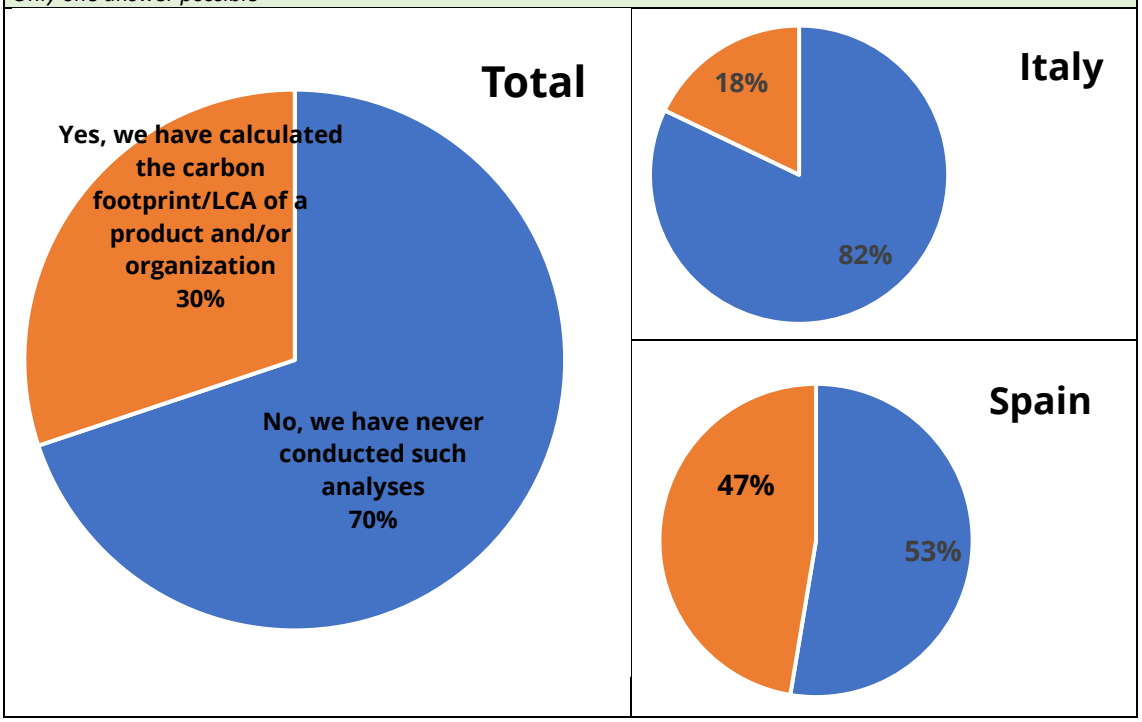

Figure 6. Percentage of companies interviewed that have carried out specific analyses to assess the environmental impact of some of its supply chains

4.2. The role of wood in carbon storage: companies' communication and consumer awareness

Although wood products can play a crucial role in carbon storage and climate change mitigation and companies generally showed to be sensitive to environmental issues (76% hold FSC or PEFC certification), the surveyed companies have generally not emphasised this in their communication. Almost 70% reported that, over the past five years, their marketing materials had not highlighted the carbon storage function of wood. This share rises to 80% among Italian companies. (Figure 7). Non-certified companies were even less inclined to promote wood's role in carbon storage, with 87% stating they had not communicated this in marketing campaigns or technical documentation (Figure 8).

Nonetheless, the majority of companies in both Italy and Spain expressed their intention to launch such communication campaigns in the future, reflecting an awareness of forthcoming European regulations in this topic.

In the past five years, has your company's promotional material highlighted the role of wood in contributing to carbon storage and thus in helping to tackle climate change? (154 respondents)
Only one answer possible

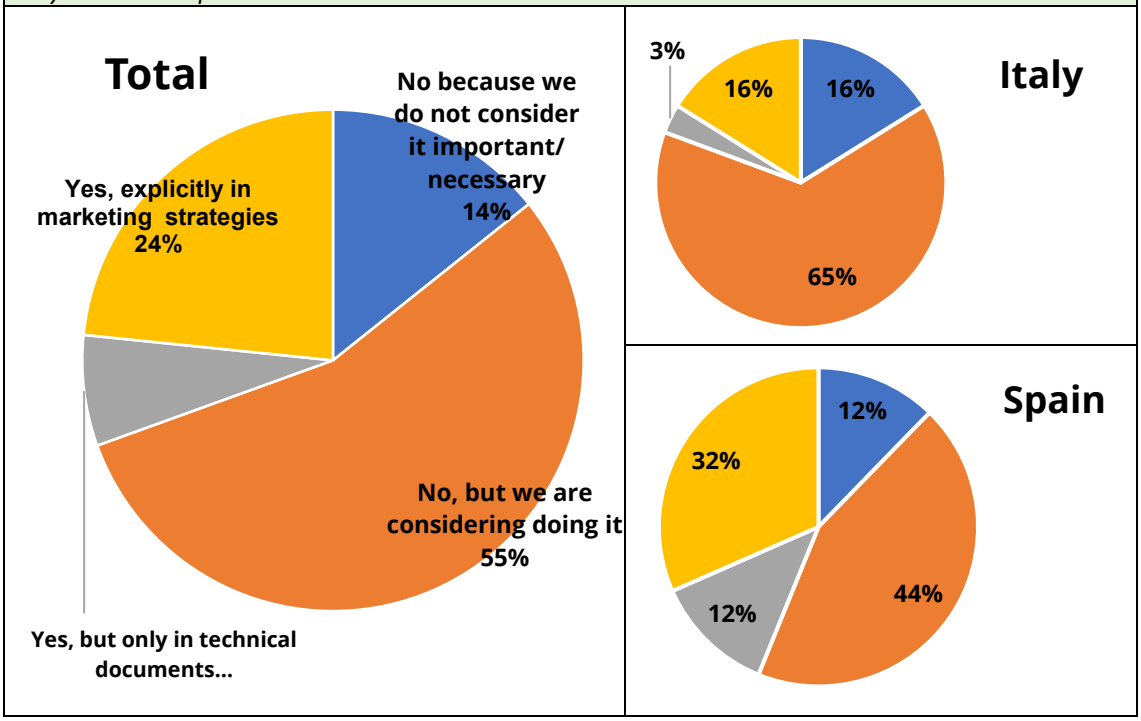

Figure 7 Percentage of companies interviewed that highlighted the role of wood in contributing to carbon storage in the company's promotional material

In the past five years, has your company's promotional material highlighted the role of wood in contributing to carbon storage and thus in helping to tackle climate change? (154 respondents)
Only one answer possible

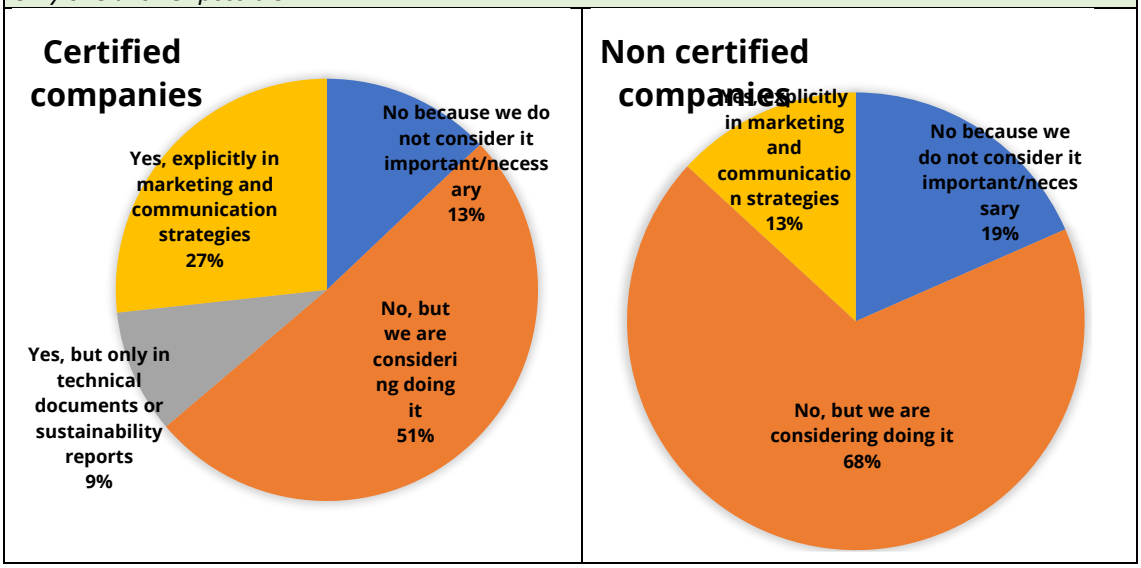

Figure 8 Percentage of companies (certified or not) interviewed that highlighted the role of wood in contributing to carbon storage in the company's promotional material

For both the companies interviewed in Italy and those in Spain, the main reason for not implementing marketing strategies related to the role of wood in carbon storage, apart from technical difficulties, is probably the awareness that most consumers are not sufficiently informed about this aspect. Indeed, only 36% of respondents believed that consumers are partially aware of the role of wood as a carbon sink. In detail, 59% of the Spanish companies and 51% of the Italian respondents considers consumers are not aware (Figure 9).

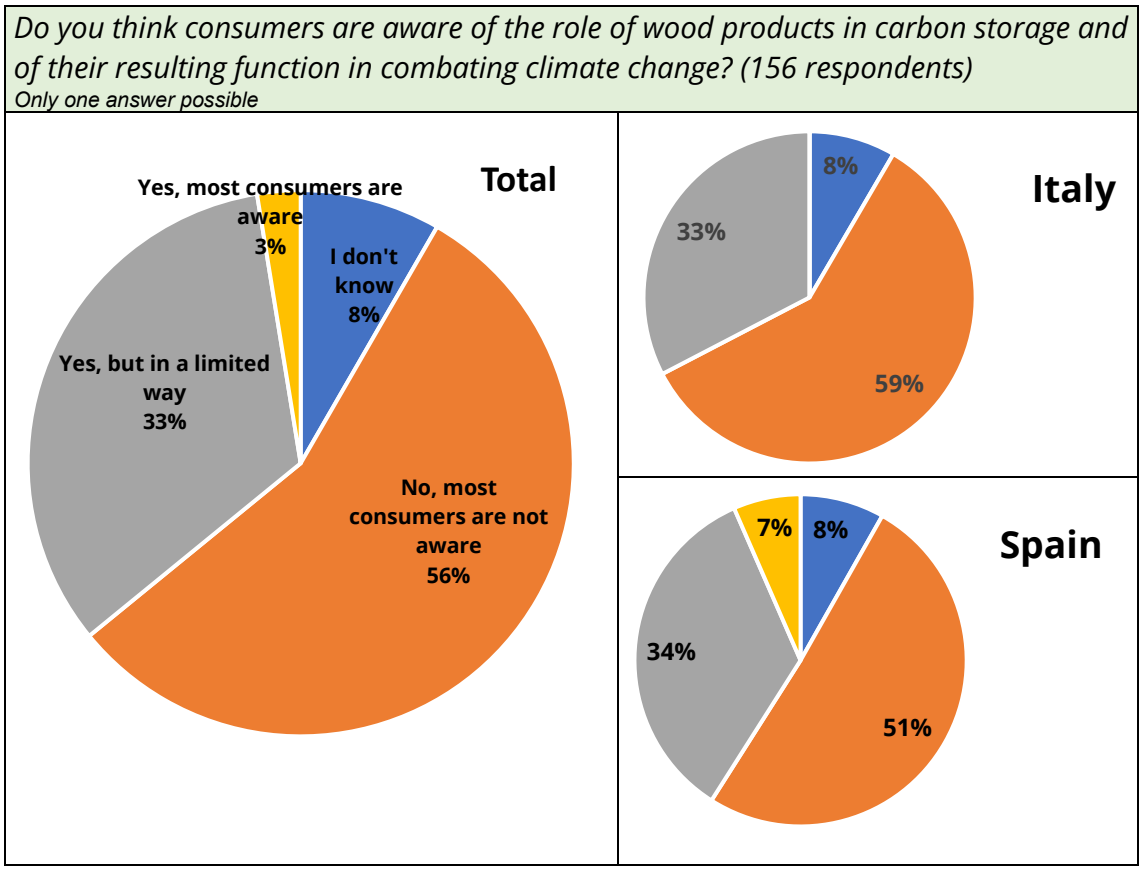

Figure 9. Consumers' awareness of the role of wood products in carbon storage is generally low, according to companies interviewed.

4.3 Companies' awareness of Regulation (EU) 3012/2024 and possible impacts of its application

Regulation (EU) 2024/3012, establishing a Union-wide certification framework for permanent carbon removals, carbon farming, and carbon storage in products, was adopted on 27 November 2024, published in the Official Journal on 6 December 2024, and entered into force on 26 December 2024. Known as the CRCF Regulation, it aims to set up a voluntary certification system to support high-quality carbon removal, soil emission reduction, and carbon storage activities, including those involving wood-based products.

While the main beneficiaries of the certification of carbon storage in products are timber building owners, companies across the wood value chain will play a key role in meeting

the Regulation's quality criteria (such as CO_2 quantification, additionality, and biodiversity co-benefits). Despite this, awareness of the CFRC Regulation among Italian and Spanish companies currently appears low. Overall, 52% of respondents reported having only limited knowledge of the Regulation, more than one quarter indicated no familiarity at all, and only 3% stated that they were well informed. The situation was similar in both countries, with nearly 70% of companies reporting little or no awareness.

What is your level of knowledge of Regulation (EU) 3012/2024 (EU Carbon Removals and Carbon Farming Certification Regulation – CRFC)? (156 respondents)
Only one answer possible

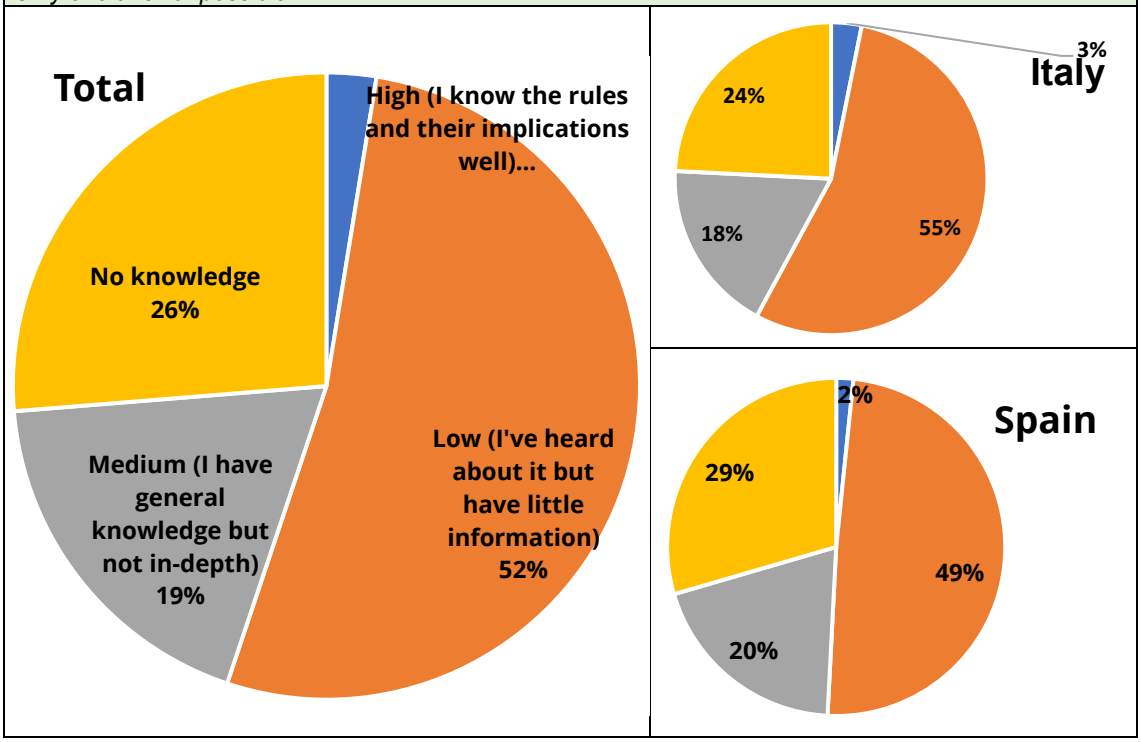

Figure 10 Level of knowledge of of Regulation (EU) 3012/2024 of companies interviewed

Looking at CoC-certified companies, however, they are generally more informed than non-certified ones with 92% of non-certified companies reported low or no awareness of the Regulation, compared with 75% of certified companies (Figure 11).

What is your level of knowledge of Regulation (EU) 3012/2024 (EU Carbon Removals and Carbon Farming Certification Regulation – CRFC)? (156 respondents)
Only one answer possible

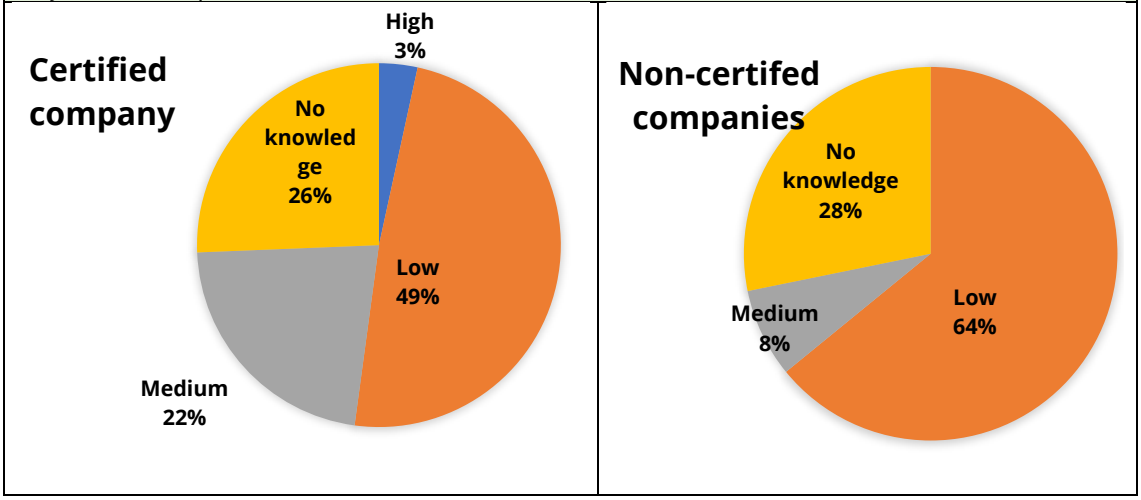

Figure 11 Level of knowledge of of Regulation (EU) 3012/2024 of companies interviewed (certified and not)

When asked about potential benefits of implementing the Regulation, respondents most frequently identified: (i) improved corporate image and competitiveness (45%), (ii) greater product transparency and traceability (39%), and (iii) increased commercial value of certified products (34%) (Figure 12). These were consistently highlighted as the top advantages by both Italian and Spanish companies.

By contrast, the main challenges identified were bureaucratic complexity and high costs, which companies expected would make the certification process difficult and financially burdensome (Figure 13). It is interesting to note that distrust in the effectiveness of European regulation is not considered among the challenges or obstacles identified by companies with respect to the implementation of Regulation (EU) 3012/2024. This is even though, recently, the implementation of many regulations, particularly those concerning environmental issues, has been highly complex, undermining the confidence of many companies and consumers.

What benefits do you foresee from the possible certification of the carbon stored in products, in line with the requirements of the CFRC Regulation? (115 respondents)

Multiple answers possible

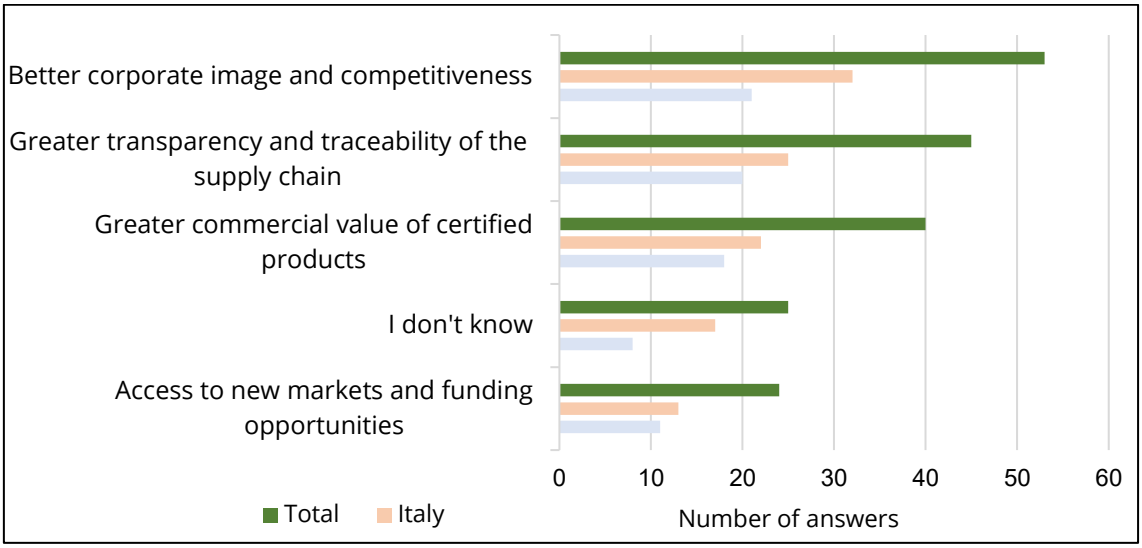

Figure 12. Main advantages that companies see in the potential implementation of the regulation Regulation (EU) 3012/2024

What could be the main challenges or obstacles in a potential certification process for the carbon stored in wood products? (108 respondents)

Multiple answers possible

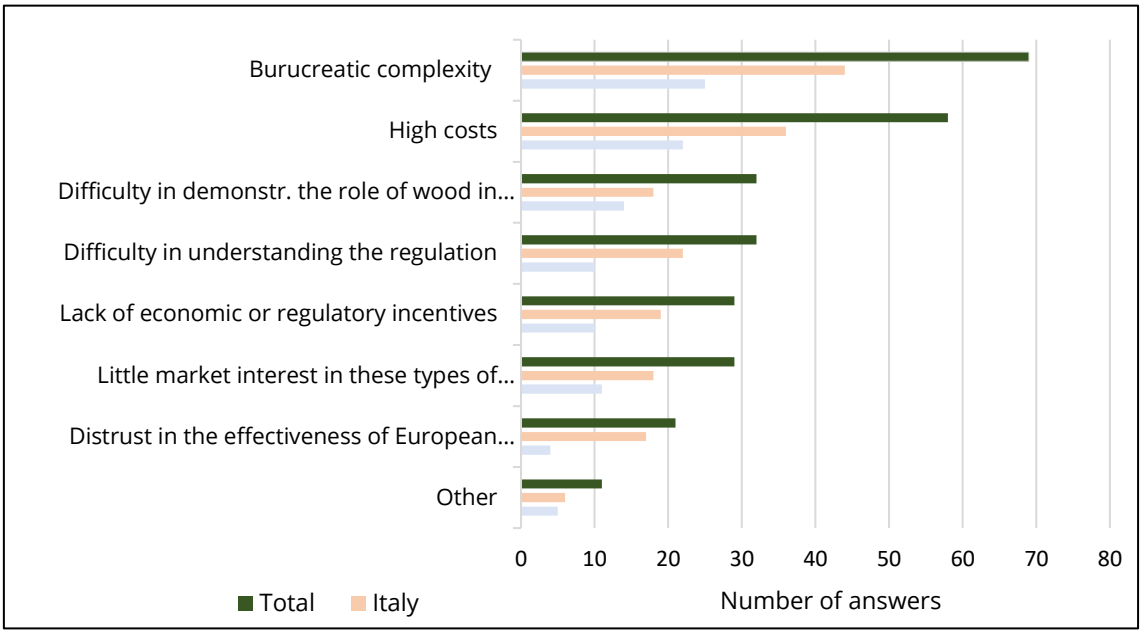

Figure 13. Main challenges or obstacles that companies see in the potential implementation of the regulation Regulation (EU) 3012/2024

With regard to the role of forest CoC certifications (FSC and PEFC) in quantifying and certifying the carbon stored in wood products, most respondents (55% overall and 63% in Italy) stated that these certifications should play a significant role in quantifying and certifying carbon stored in wood products, ideally by automatically incorporating carbon storage into their certification system (Figure 14). This view may reflect the expectations of companies already certified under these schemes. Very few respondents argued that forest certifications should remain separate from carbon-related certification frameworks.

What role do you see for existing forest certifications, such as FSC and PEFC, in certifying and quantifying the carbon stored in wood products? (155 respondents)
Multiple answers possible

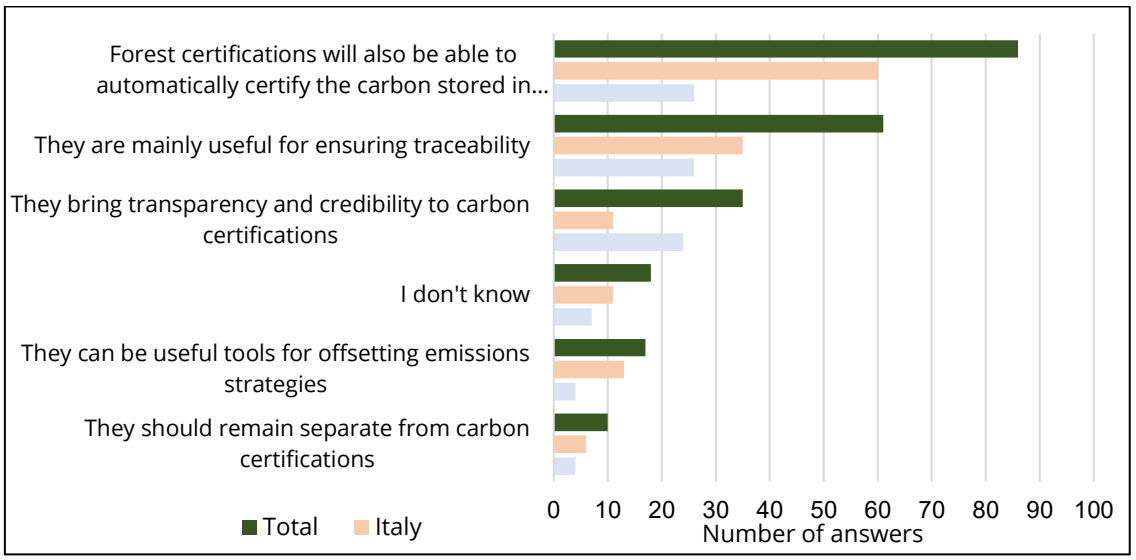

Figure 14 The role that companies see for forest certification in certifying and quantifying the carbon stored in wood products

Finally, both Spanish and Italian companies anticipated that upstream actors (particularly forest managers/owners and primary processors) might be the least adequately rewarded by carbon storage certification in wood products. Interestingly, Italian respondents (35%) expected the primary processing industries to be most disadvantaged, whereas 50% of Spanish respondents pointed to forest managers and owners (Figure 15). Reflecting this concern, 60% of companies with existing supply chain agreements (e.g. network agreements) expressed the hope that such arrangements could also be used within the framework of carbon storage certification, to ensure fair involvement of all stakeholders.

Which actors of the supply chain risks not being adequately rewarded by the certification process of the carbon stored in wood products?" (138 respondents)

Multiple answers possible

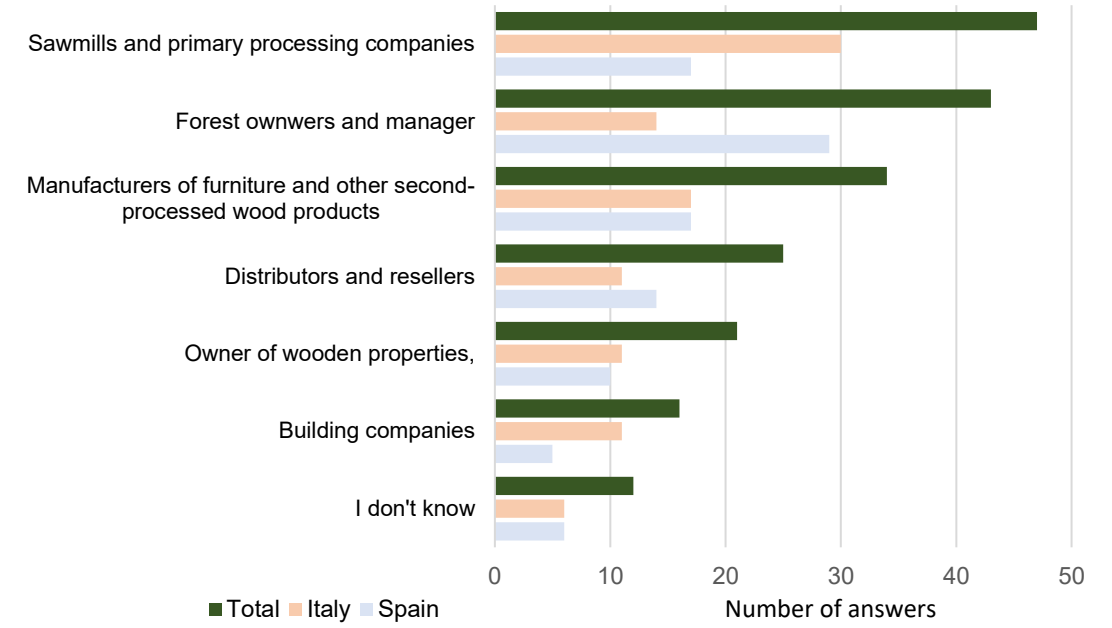

Figure 15. The actors who, according to the companies interviewed, risk not being adequately rewarded by the certification process of the carbon stored in wood products

5. DISCUSSION

The research presented in this document involved a panel of 156 companies from the wood sector in Italy and Spain. The number of enterprises engaged represents a sufficiently robust sample, allowing meaningful insights into their perceptions and attitudes regarding issues related to carbon storage in wood products. As highlighted in the introductory chapter, these issues are increasingly central to policy debates and are expected to guide consumer choices in the near future.

As first noteworthy observation is that overall, responses from Spain and Italy do not differ substantially. Out of 12 closed-ended questions in the questionnaire, only in two cases was the most frequently selected option different between the two countries considered. This is likely due to similar socio-economic context and the comparable role of the forest sector in both countries.

The panel was largely composed by CoC-certified companies (mainly FSC). This may lead to some degree of bias and overestimation compared to the average behaviour of companies in the sector with respect to adopting practices to reduce environmental impacts (such as supply chain monitoring policies or analyses for assessing greenhouse gas emissions). At the same time, however, responses of CoC-certified companies provide valuable insights into consumer attention toward sustainability issues, as certification itself reflects both a commitment to environmental responsibility and a proactive inclination toward the adoption of environmental marketing strategies**.**

Despite this, less than 40% reported having procedures in place to monitor impacts of their supply chains (indirect impacts), and only 30% had carried out specific analyses related to GHG emissions, such as LCA or carbon footprint evaluations. These findings are consistent with earlier studies, such as Llanatda et al. (2018), who found that LCA is little known and rarely applied in the Basque region (Spain), and Iraldo et al. (2015), who identified costs and resource constraints as the main barriers to its application in the Italian context

Nonetheless, there are signs of growing interest: Environmental Product Declarations (EPDs), based on LCA methodologies, have increased markedly in recent years. In Italy, the number of EPDs published by EPDItaly[9] rose from 110 in 2020 to 542 by June 2024. This trend (from 2016 onwards) appears to be driven by the increasing integration of life-cycle approaches into EU policies and regulations (Sala et al., 2021). Another important issue highlighted by Sala et al. (2021) is the need to harmonise methodologies in Life Cycle Assessment (LCA) and improve communication of results to non-specialists and consumers.

The complexity of the technical aspects of LCA, as well as other analyses related to monitoring value chain impacts, may help explain why nearly 70% of the respondents in our survey stated that they do not emphasize the role of timber as a carbon sink in their

[9] Data on EPD developed and published in Italy are available at the following link: https://www.epditaly.it/2024/07/30/crescita-delle-epd-e-delle-pcr/

marketing and sustainability strategies. This challenge of effectively communicating the environmental benefits of wood use has been highlighted by Primožič and Kutnar (2022) and, more recently, by Riedl (2025) and the Timber Living Lab (2023). Although referring respectively to the specific contexts of the Czech Republic and Italy, these studies have emphasized the frequent lack of a coherent, long-term narrative on the environmental benefits of wood use that is shared among the various stakeholders.

Such reluctance in communication, alongside the challenge of delivering messages in a clear and easily understandable manner, is partly driven by the perception that consumers lack any real awareness of the role of wood in carbon storage and, consequently, in mitigating climate change. In fact, 56% of companies (59% in Italy and 51% in Spain) considered consumers to be unaware of the role of wood in storing carbon. Similar findings were reported by Petruch and Walker (2021) in Austria, particularly among young consumers. By contrast, Roos et al. (2023) showed that in Nordic countries, where forestry plays a more central economic role, consumers are more inclined to recognise the climate benefits of wood products. Nonetheless, even in these countries, it remains necessary to further improve, document, and communicate to the public the contribution of wood to climate and biodiversity, particularly among those who are more distant from the forest sector.

Awareness of the CRCF Regulation (EU) 2024/3012, adopted on 6 December 2024, is still low according to our survey. Almost 70% of surveyed companies reported little or no knowledge of the Regulation, despite the fact that its certification framework for carbon storage in wood products is expected to become operational in 2026. This is a concerning gap, particularly as the survey targeted actors expected to play a central role in the CRFC regulation implementation. Low awareness of EU rules has likewise been observed in other context relevant to the wood sector, such as the EU Timber Regulation (EUTR). (Giurca and Jonsson, 2015).

The main issues identified by companies in relation to the implementation of the CRFC Regulation, and consequently the certification process, are predominantly associated with costs and the required bureaucratic procedures. This can be attributed to the fact that most companies are already certified (FSC or PEFC) and are therefore familiar with a process that can be burdensome, both economically and administratively, to obtain third-party certification. This aspect has also been recently highlighted by Lindahl and Andersson (2025) in the Swedish context, specifically with regard to FSC and PEFC certifications. The companies involved in the survey acknowledge that these costs are expected to place a disproportionate burden on smaller firms, which constitute the upstream segments of the Italian and Spanish supply chains (e.g., sawmills and forest owners/managers). For this reason, they identify these actors as those who may be less advantaged by the implementation of the CRCF Regulation. Nevertheless, an increasing number of agreements are now available, which can be used to involve the different actors along the supply chain and to share costs. One such example is the Forest Agreement in Italy, implemented through the Decree Ln.77/2021, and adopted, for

instance, by the Community Cooperative "L'Ecosistema" in Castell'Azzara[10]. In this case, thanks to the establishment of a Forest Agreement (the first in Italy), it was possible to organize the collective management of the properties of three agricultural enterprises that joined the project in order to obtain FSC certification and to valorise and verify forest ecosystem services.

Existing forest certifications remain widely trusted. In fact, over half of surveyed companies (55%) believed that FSC and PEFC could also serve as reliable frameworks for verifying and quantifying carbon storage in wood products, a perspective also identified by Paluš et al. (2021) in the Czech Republic, who conducted a survey among forest owners.

The important role of forest certifications in quantifying the carbon stored in wood products can be further reinforced by the fact that consumers increasingly recognise the value of schemes such as FSC. In fact, according to FSC International (2023), 62% of consumers familiar with FSC state that they would choose FSC-certified products over non-certified equivalents. Moreover, nearly half (49%) report that they are willing to pay a higher price for FSC-certified products. Of course, as has been emphasized, even for existing and more widely recognized certifications, such as FSC and PEFC, it is necessary to increase consumer awareness of labels attributes through well-designed advertising campaigns, that should be developed with the collaboration of governments, NGOs, and environmental groups (Panico et al., 2022). Therefore, the introduction of additional certifications concerning wood, such as those related to its capacity to store carbon, should be accompanied by targeted communication campaigns in order to avoid creating confusion among consumers. This type of targeted communication for the forest sector, tailored to different types of stakeholders, is essential to ensure that all actors can benefit from the development of the sector (Lähtinen et al., 2017).

According to our survey, certified companies, in addition to having a tool that can already serve as a functional instrument for certification to quantify the carbon stored in wood products, also demonstrated higher awareness of the CFRC regulation and a greater willingness to communicate the environmental benefits derived from the use of wood. These conclusions were also reached by Bruzzese et al. (2025), who showed that certified companies (specifically under PEFC) display increased environmental awareness within the organisation and greater recognition of their products in the market.

Table 1 presents a SWOT analysis of the potential implementation of certifications for carbon stored in products under CRCF Regulation, with particular emphasis on the anticipated responses from both the market and wood sector companies.

[10] All the information of this agreement is available of the following link: https://seacoop.com/project/accordo-di-foresta-del-monte-penna

Strengths • The presence of the CRCF Regulation, which in the coming months will provide clear methodologies for calculating the carbon stored in wood products. • The growing role of timber in the building sector. • Carbon footprint and LCA are increasingly required by European regulations and procedures, making these tools more commonly adopted by companies. • In the forestry sector, the existence of well-established certification schemes (FSC and PEFC) already recognized by consumers.	**Weaknesses** • Limited knowledge of the CRCF Regulation among companies, despite their fundamental role in the process of certifying carbon stocks in wood products. • The initial stages of the timber supply chain in Italy and Spain are relatively weak, making certification costs particularly burdensome. • Wood sector companies are not yet adequately prepared to communicate the role of wood in carbon storage.
Opportunities • Companies demonstrate a high level of trust in FSC and PEFC, which could potentially serve as a reference framework for certifications required under the CRCF Regulation. • A growing number of instruments designed to facilitate agreements among companies within the same supply chain.	**Threats** • Low consumer awareness of the role of wood in storing carbon and in combating climate change, which makes the market poorly inclined to demonstrate a greater willingness to pay for wood products based on their ecosystem service benefits.

Table 1. SWOT analysis regarding the implementation of certifications concerning the carbon stored in products, with particular emphasis on the potential responses of both the market and wood sector companies

6. CONCLUSIONS

The results of survey conducted in the context of sub-task 3.2.3 (Characterisation of supply chain of wood-based products) highlighted several key aspects that should be considered by policymakers, industry associations, forest certification schemes, and within the forthcoming activities of the WOOD4LIFE project. These findings become even more significant in view of the forthcoming implementation of the CRCF Regulation. The main results can be summarised as follows:

- For mainly economic and technical reasons, companies in the wood sector still make limited use of tools such as Life Cycle Assessment (LCA), although there is widespread recognition that these will become increasingly important in the near future.
- Companies rarely communicate the environmental benefits of wood use, such as its contribution to carbon storage.
- There is a widespread perception that consumers are not fully aware of the environmental benefits of using wood, including in construction. Consequently, there is little evidence of market willingness to pay a premium price for wood products based on their contribution to the maintenance and enhancement of ecosystem services.
- Knowledge of the CRCF Regulation among companies is relatively low, although certified forest companies (CoC) appear to be better informed about its entry into force.
- Companies expect existing forest certification schemes to play an important role in future certification systems designed to quantify the carbon stored in products.
- There is a clear need for greater cooperation across the entire value chain to share certification costs, thereby alleviating the burden on upstream actors, which are generally smaller enterprises.

These findings highlight the urgent need, particularly for policymakers in Spain and Italy, to launch consumer awareness campaigns on the benefits of using wood, following the example of the *Austrian Wood Initiative*[11]. However, such campaigns should also be supported by companies in the sector, which in turn must be properly informed and sensitised to the objectives of European regulations and initiatives aimed at promoting the use of wood in construction sector.

Both Italy and Spain already have relatively strong associations of timber actors, such as the *Italia Foresta Legno* Cluster and AIEIM, which could play a pivotal role in mobilising companies across the value chain. At the same time, forest certification schemes such as FSC and PEFC will need to clarify their role in the process of quantifying the carbon

[11] Main elements of the Austrian Timber Initiative is available at: https://www.bmluk.gv.at/dam/jcr:0224d736-2660-4345-b2a7-160f17427dfa/BML_Waldfonds_Publikation_A4_64stg_EN_18_BF.pdf

stored in wood products. Likewise, the certification schemes that will be developed under the CRCF Regulation should take into account, as key elements, the lessons learned from the FSC and PEFC certification processes.

For the WOOD4LIFE project, the findings underline the importance of the carbon tool to be developed under WP5 as companies need cost-effective instruments to calculate the emissions of their supply chains.

As regards WP6 (*Sustainability, replication and exploitation of project results*), activities should begin from the assumption that consumers are still largely unaware of the environmental benefits of using wood in the building sector. Even the carbon storage capacity of wood, arguably the most easily recognised benefit, is probably not well understood by consumers, meaning that its broader role in supporting ecosystem services, such as biodiversity, is even less acknowledged.

Finally, the survey provides important input for Tasks 6.3 and 6.4: only through the effective aggregation of different actors along the value chain will it be possible to organise impactful communication campaigns and create functional clusters capable of facilitating access to forest certification schemes.

REFERENCES

Eurostat (2025). Forests, forestry and logging - Statistics Explained. Luxembourg

Fabio Iraldo, Francesco Testa, Sara Tessitore, Benedetta Nucci and Tiberio Daddi (2015). The "state of play" in life cycle assessments: a survey on how Italian companies perform life-cycle assessments and product footprints. Environmental Economics, 6(2), 10-2

FAO (2020). *Carbon Storage and Climate Change Mitigation Potential of Harvested Wood Products:* Background Paper prepared for the 61st Session of the FAO Advisory Committee on Sustainable Forest-based Industries, Forest Products and Statistics Team. Rome, Italy

FAO. (2020a). *The State of the World's Forests 2020: Forests, Biodiversity and People.* Rome: Food and Agriculture Organization of the United Nations.

FSC International (2023). FSC® Consumer recognition study Global Report – June 2023. FSC international. Bonn. Germany

Giurca, A., Jonsson, R. (2015). *The opinions of some stakeholders on the European Union Timber Regulation (EUTR): An analysis of secondary sources.* iForest – Biogeosciences and Forestry, 8(5), 681–686.

Grassi, G., Fiorese, G., Pilli, R., Jonsson, K., Blujdea, V., Korosuo, A. and Vizzarri, M., Brief on the role of the forest-based bioeconomy in mitigating climate change through carbon storage and material substitution, Sanchez Lopez, J., Jasinevičius, G. and Avraamides, M. editor(s), European Commission, 2021, JRC124374.

Himes, A., & Busby, G. (2020). Wood buildings as a climate solution. *Developments in the Built Environment, 4*

Iascone, B. (2022). Gli imballaggi di legno (consuntivo 2022). On-line paper on "Italia Imballaggio"

IPCC (2019). Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

IPCC (2021): Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

IPCC (2023) Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva. Switzerland

IPCC. (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press.

Lähtinen, K., Toppinen, A., Suojanen, H., Stern, T., Ranacher, L., Burnard, M., Kuzman, M. K. (2017). *Forest sector sustainability communication in Europe: A systematic literature review on the contents and gaps*. *Current Forestry Reports, 3*(3), 173–187.

Lindahl, H., & Andersson, E. (2025). *Symbolic or Strategic? Understanding FSC and PEFC Certification in Resource-Constrained SMEs: The Swedish Timber Industry* (Master's thesis, Malmö University).

Llantada, A., Martínez de Alegría Mancisidor, I., Díaz de Basurto Uraga, P., Insunza Aranzeta, G. (2018). *Use of life cycle assessment by companies in the Basque region: Results of survey research*. Journal of Cleaner Production, 204, 20–32

Paluš, H., Krahulcová, M., Parobek, J. (2021). *Assessment of Forest Certification as a Tool to Support Forest Ecosystem Services*. *Forests, 12*(3), 300.

Panico, T., Caracciolo, F., Furno, M. (2022). *Analysing the consumer purchasing behaviour for certified wood products in Italy*. *Forest Policy and Economics, 136*, 102670.

Petruch, M., & Walcher, D. (2021). *Timber for future? Attitudes towards timber construction by young millennials in Austria – Marketing implications from a representative study. Journal of Cleaner Production, 294*, 126324. https://doi.org/10.1016/j.jclepro.2021.126324

Pettenella, D., Pelosi, M.G., Corradini, G. (2023). Le foreste nel Regolamento UE Carbon Removal Certification: più problemi che soluzioni? Sherwood, Foreste ed alberi oggi, 2023

Primožič, L., Kutnar, A. (2022). *Sustainability Communication in Global Consumer Brands.* Sustainability, 14(20), Article 13586.

Reid, H., Huq, S., Inkinen, A., , J., Macqueen, D., Mayers, J., Murray, L. and Tipper, R. (2004). *Using wood products to mitigate climate change: a review of evidence and key issues for sustainable development*. IIED, London.

Riedl, M. (2025). *Forestry Communication and Public Perception: Insights from the Czech Republic*. *Forests*, 16(5), 818

Roos, A., Hurmekoski, E., Häyrinen, L., Jussila, J., Lähtinen, K., Mark-Herbert, C., Nagy, E., Toivonen, R., & Toppinen, A. (2023). *Beliefs on environmental impact of wood construction*. *Scandinavian Journal of Forest Research, 38*(1–2), 49–57.

Sala, S., Amadei, A. M., Beylot, A., & Ardente, F. (2021). *The evolution of life cycle assessment in European policies over three decades*. The International Journal of Life Cycle Assessment, 26, 2295–2314.

Timber Perception Lab (2023). Timber Perception Lab - First year report. Website: timberperceptionlab.org

United Nations Environment Programme (UNPEP)(2025). *Frontiers 2025: The Weight of Time – Facing a new age of challenges for people and ecosystems*. Nairobi.

World Meteorological Organization. (2024). *State of the Global Climate 2023*. Geneva, Switzerland