

# Evaluation of the environmental commitment of all large and medium-sized Spanish wineries based on objective information from their websites

ASUNCIÓN AGULLÓ-TORRES , FRANCISCO-JOSÉ DEL CAMPO-GOMIS\* ,  
DAVID-BERNARDO LÓPEZ-LLUCH , IRENE ARIAS-NAVARRO 

*Department of Agro-Environmental Economics, Agro-Food and Agro-Environmental Research and Innovation Institute (CIAGRO), Miguel Hernández University, Elche, Spain*

\*Corresponding author: [francis.delcampo@umh.es](mailto:francis.delcampo@umh.es)

**Citation:** Agulló-Torres A., Del Campo-Gomis F.J., López-Lluch D.B., Arias-Navarro I. (2026): Environmental commitment assessment of Spanish wineries based on their website information. *Agric. Econ. – Czech*, 72: 190–206.

**Abstract:** In the contemporary era, organisations have embraced the internet as a platform through which they disseminate information about their economic activities and their corporate social responsibility, including their environmental responsibility. Consequently, the extent to which an organisation's actions are visible on its website can be taken as an indicator of its commitment to environmental issues. The present article proposes a model for evaluating the environmental commitment of agri-food companies through the visibility of objective information on their environmental actions on their websites. The information is presented in tabular form, consisting of 33 items, and the combination of these with a predetermined weight gives an index called the Environmental Commitment Web Index (ECWI). The model was applied to all large and medium-sized Spanish wineries in 2018 and 2024. The findings indicate an improvement in the environmental commitment of these wineries, as reflected by the doubling of the ECWI during this period from 9.8 points in 2018 to 20.2 points in 2024. Nonetheless, the overwhelming majority of these wineries were regarded as exhibiting a 'very poor' environmental commitment: 94.2% in 2018 and 81.4% in 2024. It is concluded that all large and medium-sized Spanish wineries should undertake sustained endeavours to disseminate environmental initiatives on their websites.

**Keywords:** agri-food companies; corporate social responsibility (CSR); online transparency; sustainability reporting; environmental initiatives disclosure; agri-food sector sustainability

The behaviours of corporations have a significant impact on the lives of citizens all over the world. The aforementioned impacts are exerted upon the services and products offered by companies, as well as the opportunities and employment prospects endangered by their operations. As demonstrated by Aljarah and Ibrahim (2020), the concept under discussion encompasses health and working conditions, training, innovation and education, and the environment. This is commonly defined as corporate social responsibility (CSR) (Carroll 2021). The fundamental principles of CSR encompass

voluntariness (Erauskin-Tolosa et al. 2020), exceeding legal obligations, enhancement of quality of life (Chia et al. 2020), sustainable development and ongoing dialogue with stakeholders (Lu et al. 2021). As Le (2023) argues, there is an imperative for corporations to integrate economic and social values into their practices.

In recent years, the European Union has approved a range of measures, both mandatory and voluntary, with the aim of promoting CSR (EC 2019, 2022). The European Commission (EC COM/2011/0681; EC 2022) defines CSR as the 'responsibility of enterprises for their impact

---

Supported by the Casa Sicilia Chair of Wine Tourism and Wine Culture at Miguel Hernández University in Elche (publication fees).

© The authors. This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0).

<https://doi.org/10.17221/41/2025-AGRICECON>

on society'. Consequently, it is incumbent upon companies to lead this initiative. It is possible for companies to demonstrate responsibility towards society by incorporating elements pertaining to the environment, society and the economy into their business culture, whilst also ensuring compliance with legal obligations.

The CSR economic pillar is concerned with the enhancement of the quality of public services provided, the addressing of corruption (Thanetsunthorn 2022), supplier-customer relations (Fang and Zang 2018; Govindan et al. 2020), and the organisation's proactive approach to addressing public interests (Caputo et al. 2021). This area is intrinsic to every organisation and represents the most sophisticated aspect of CSR. In addition, a number of challenges must be given full consideration, including the creation of added value for customers (Iglesias et al. 2020), innovation (Padilla-Lozano and Collazo 2022), sustainable growth (López et al. 2022), and the minimisation of economically negative consequences (Schiessl et al. 2022).

The concept of CSR as a social pillar has been demonstrated to enhance organisational human capital, otherwise referred to as the 'internal customer'. The social sphere is subject to direct influence from corporate through relationships and working conditions (Chaudhary 2017). The challenge lies in enhancing employees' competencies, encompassing the provision of training opportunities, and engaging them in initiatives that foster a sense of community within the organisational framework (Abbas and Dogan 2022; Paruzel et al. 2023).

The CSR environmental pillar is predicated on the premise that every organisation has an impact on the environment (Newman et al. 2020). The reduction of negative impacts is the fundamental principle of this pillar (Le 2022). In contemporary times, organisations in developed countries are bound by legislation that obliges them to adhere to environmental regulations as part of the legislative framework (Barauskaite and Streimikiene 2021). Moreover, it is evident that the development of activities and projects with a focus on environmental protection is imperative (Pan et al. 2021).

Porter (1991) identified environmental concern as a competitive advantage that firms should pursue and recommended that the Environmental Protection Agency should stimulate investment and innovation in this area. The existence of a direct relationship between environmental protection and firms' financial performance has been demonstrated by Albertini (2013) and Feng et al. (2022). Consequently, organisations have transformed their concern about the potential impact

of environmental protection on their business performance into a strategic commitment to the environment. This phenomenon has been identified as one of the three thematic areas of CRS: environmental responsibility (ORSC 2017; Doan and Sassen 2020).

The concept of environmental responsibility has evolved into a crucial aspect of consumer behaviour, motivating individuals to actively seek out environmentally responsible purchasing options (Vu et al. 2022). Nevertheless, despite these efforts, the benefits of purchasing from companies that claim to make better environmental choices may not be as substantial as people believe.

In the contemporary business landscape, there is an increasing awareness among both businesses and consumers of deceptive or even fallacious assertions pertaining to the societal and environmental behaviour of organisations. The practice of publishing extensive statements on corporate environmental and social responsibility without subjecting them to rigorous scrutiny has been largely superseded (De Freitas Netto et al. 2020; Uyar et al. 2020; Chen and Dagestani 2023). Consequently, there has been a notable surge in interest among companies in environmental engagement, which has prompted them to implement effective digital communication strategies, with the corporate website occupying a pivotal position (Siano et al. 2016). In this regard, Heinze and Heinze (2023) have observed that, over a period of 13 years, all Standard & Poor's 500 companies across all industries have increased their environmental CSR initiatives and website-based ones.

The agri-food industry has been the subject of several studies due to its social and environmental impact (Martos-Pedrero et al. 2019), but the growing global concern for the sector has not been reflected in research on the management of its organisations (Fontoura et al. 2016). Despite the recent emergence of research in the field of agri-food sustainability, there remains a scarcity of studies addressing business management issues, and the citation rates for published works are low. The majority of published literature focuses on environmental impact mitigation, with a smaller proportion addressing sustainability information disclosure.

A recent literature review by Muriel et al. (2025) examined the disclosure of sustainability information in the agri-food sector. It was found that the topic had received minimal attention from management and organisational scholars. Consequently, there has been relatively limited research on how agribusinesses engage in demonstrating sustainability through published sustainability reports. It was highlighted that

<https://doi.org/10.17221/41/2025-AGRICECON>

there is a paucity of research into the implementation of sustainability practices in the agri-food sector, as well as the manner in which these practices were communicated to stakeholders once they were operational. Research on sustainability reporting is limited in the agri-food sector, in contrast to other industries. This may be attributable to the erroneous assumption that results from more general domains are directly applicable. However, given the unique social and environmental characteristics of this sector, there is a crucial need for specialised research on sustainability reporting disclosure. Furthermore, the agri-food sector is an integration of agriculture and the food industry, necessitating separate analysis to comprehend its complexity.

Topp-Becker and Ellis (2017) posit that sustainability reporting does not constitute a priority for all companies within the agricultural supply chain. Notwithstanding this, research in this area has grown exponentially, with 50% of the papers published in the last two years (2023–2024). Geographically, several studies have focused on the European Union (Echanove Franco 2020; Conca et al. 2021; Anguiano-Santos and Rodríguez-Entrena 2024; Buil et al. 2024). The most common research approaches to sustainability were historical and content analysis, as well as mixed approaches, suggesting an early stage of empirical research. It is noteworthy that only a single paper has approached the subject from a theoretical perspective (Vergragt and Brown 2008). The majority of studies were found to be deficient in terms of theoretical frameworks, despite the recognised importance of effective coordination of actors within the agri-food supply chain for social, economic and environmental performance (Luo et al. 2018). A thorough review of extant literature discloses that merely two studies on sustainability disclosure are supported by a theoretical framework: Buil et al. (2024) examined stakeholder theory, while Wichianrak et al. (2022) utilised legitimacy theory.

In the context of Spanish agri-food companies, an analysis of the extent of web adoption was conducted by López-Becerra et al. (2016). The study's findings suggested that the utilisation of web technologies has the potential to enhance relationships with suppliers and customers, as well as the quality of services offered by companies. In 2024, Anguiano-Santos and Rodríguez-Entrena conducted a study to explore and analyse the impact of the Directive 2014/95/EU (the Non-Financial Reporting Directive, NFRD) on the agri-food sector. This directive was transposed into Spanish Law 11/2018. The study's findings indicated a low level of disclosure

of the SRs of 16 agri-food companies that had adopted the Global Reporting Initiative (GRI) standard.

In the Italian wine industry, Bertorelli et al. (2023) conducted a comprehensive evaluation of the industry's performance in terms of sustainability and its communication to stakeholders, through a panel of 70 companies. An evaluation model was developed for the study and used to analyse all of the websites and, if present, the companies' sustainability reports. The primary conclusion drawn from this analysis was that the Italian wine sector had not communicated its sustainability efforts in an effective manner, as only 43% of the panel had comprehensive communication.

It can thus be concluded that there is a paucity of research on the implementation and communication of sustainability practices in the agrifood sector, particularly in the Spanish wine sector. The most relevant paper regarding sustainability communication was Siano et al. (2016) with more than 120 citations, which developed an index to evaluate environmental commitment through web information. A review of the literature revealed a single paper that focused on the communication of sustainability in the Italian wine sector, as published by Bertorelli et al. (2023).

In view of the aforementioned background, it has become necessary to consider the necessity of advancing our understanding of the means by which the environmental commitment of a company in the agri-food sector can be evaluated in accordance with the objective information provided on its website. The article's novelty is reflected in its objective: namely, to define a model for assessing the environmental commitment of agri-food companies based on objective information provided on their websites. Furthermore, the objective is to implement this model in a practical case study encompassing large and medium-sized wineries in Spain over a two-year period: 2018 and 2024. This will facilitate an investigation into whether there has been a change in environmental commitment and its communication on the web since the outbreak of the worldwide pandemic provoked by the SARS-CoV-2 virus.

## MATERIAL AND METHODS

**Theoretical framework.** In 2016, Siano et al. were the first to evaluate environmental commitment through web information, proposing an index to identify and assess sustainability communication requirements on corporate websites. The index was based on an operational model comprising a pyramidal structure with four dimensions, 18 subdimensions and 64 items.

<https://doi.org/10.17221/41/2025-AGRICECON>

The model was comprehensive, encompassing all aspects of CSR relating to environmental protection and social responsibility in relation to economic success. However, it also incorporated a number of subjective elements, including accessibility, navigability, usability, interactivity, clarity, authenticity, consistency and greenwashing. Nevertheless, we have deemed the fundamental concept of the model applicable to our objective, albeit with certain adaptations. The process entails the exclusion of components that are incapable of being objectively quantified based on their presence or absence in online sources. Concurrently, it encompasses the incorporation of supplementary components that are deemed indispensable for the evaluation of environmental performance. This approach is predicated on the key environmental factors that should, in this author's opinion, be evident on agri-food company websites, as Kondoh et al. (2012) previously demonstrated in their analysis of the success factors of eco-business activities in companies.

In view of the aforementioned points, the Environmental Commitment Web Index (ECWI) was developed. This index establishes a correlation between the sustainable development initiatives of agri-food companies and their macro-scale environmental impact. The ECWI is composed of three dimensions: orientation (ECWSI-O), structure (ECWI-S) and content (ECWI-C), nine subdimensions, and 33 items (Table 1). These items are dichotomous variables that evaluate specific, objective aspects of environmental commitment, which can easily be identified on agri-food companies' websites. The items under consideration are grouped into homogeneous categories through the subdimensions, which belong to a larger grouping called a dimension. In accordance with the methodology proposed by Siano et al. (2016), the ECWI is calculated by combining the 33 items linearly, with the points assigned to each item forming the basis of this calculation (Table 1). Accordingly, each of the three ECWI dimensions (ECWI-O, ECWI-S and ECWI-C) is calculated by the linear combination of the respective items (2, 11 and 18), according to the points indicated in Table 1. Consequently, the ECWI is assigned a value on a scale from 0 to 100 points, while the scales of its components are as follows: The ECWI-O scale ranges from 0 to 10 points, the ECWI-S scale ranges from 0 to 30 points, and the ECWI-C scale ranges from 0 to 60 points.

The environmental commitment of an agri-food company is assessed using an ECWI scale of 0 to 100. It is evident that a score of 100 denotes the maximum

environmental commitment, as stipulated in the objective information provided on the company's website. In accordance with the criteria established by Siano et al. (2016), the classification of agri-food companies is determined by their ECWI score, which is then assigned to one of five categories: very good, good, acceptable, poor or very poor. This classification can also be extended to each of the three components: the ECWI-O, ECWI-S and ECWI-C (Table 2).

**Data collection.** A practical application was elected to be undertaken in one of the most dynamic sectors of Spanish agri-food companies, namely wineries. The present study examines the environmental commitment of all large and medium-sized Spanish wineries using the ECWI and its three dimensions (ECWI-O, ECWI-S and ECWI-C) over the period 2018–2024. This will also facilitate an analysis of the evolution of this commitment over the same six-year period, during which the use of information technologies among companies accelerated due to the pandemic caused by the SARS-CoV-2 virus. Furthermore, an annual analysis will be conducted to ascertain the existence of statistically significant differences (SSDs) depending on various business characteristics, including size, business model, involvement in wine tourism on the website, and the presence of an online shop on the website.

The wine sector is of considerable economic, social and environmental significance in Spain. Spain is the world's foremost nation in terms of surface area, representing 13.1% of the global total (945.061 ha), and the third largest producer, accounting for 11.9% of the global output (28.3 million hl) (OIV 2024). The wine industry is of significant importance within the broader Spanish food industry, accounting for 13.2% of the total number of companies, 5.5% of total turnover, and 6.7% of total employment. However, a notable concentration of both production and employment is evident, with the top 10 wineries accounting for approximately 42% of sales and employing 31% of the entire wine industry (MAPA 2023).

In view of the considerable number of wineries and the notable concentration of activity in a few companies, it was decided to limit the scope of the analysis to wineries classified as large and medium in accordance with Spanish Law (Ley 5/2015). The legislation under scrutiny establishes a classification of companies based on two criteria: the number of employees and the turnover or assets. In the context of the present legislation, companies are designated as medium in size if they employ between 50 and 250 individuals, generate a turnover of more than EUR 10 million and

<https://doi.org/10.17221/41/2025-AGRICECON>

Table 1. Model for evaluating the environmental commitment of agri-food companies in accordance with the objective information offered on their websites

Dimension / Subdimension / Item	Points
ECWI = (ECWI-O) + (ECWI-S) + (ECWI-C)	100
<b>1. ECWI-Orientation (ECWI-O)</b>	<b>10</b>
11. Mission: Explicit reference to environmental commitment	5
111. Explicit reference to environmental commitment in the mission	5
12. Vision: Explicit reference to environmental commitment	5
122. Explicit reference to environmental commitment in the vision	5
<b>2. ECWI-Structure (ECWI-S)</b>	<b>30</b>
21. Tools for stakeholder environmental engagement	10
211. Example of a stakeholder's environmental commitment	2
212. Membership to an environmental forum or consortium	2
213. Having a corporate blog on the environment	2
214. Interactive environmental graphics	2
215. Environmental glossary and FAQ	2
22. Organisational model of environmental governance	10
221. Environmental committee	4
222. Environmental office	4
223. Contacts of environment	2
23. Corporate identity tools for environmental governance	10
231. State they are committed to or have practices that respect the environment	2
232. Environmental policy	3
233. Environmental report	5
<b>3. ECWI-Content (ECWI-C)</b>	<b>60</b>
31. Environmental initiatives	10
311. Related to the core business	4
312. Related to the value chain	3
313. Of general interest to society	3
32. Environmental visibility	14
321. Environment info on the website home page	3
322. Show environmental logos on the website home page	2
323. Environmental info on other website pages	2
324. Show environmental logos on other website pages	1
325. Has a page or section about environment	3
326. Posts environmental news	3
33. Environmental practices	16
331. Substitution of products or services with less environmental impacts	4
332. Reduction of costs in the production and supply of products or services to customers	4
333. Reduction of waste and emissions in the products or services offered	4
334. Transformation of waste generated in production into valuable goods or resources	4
34. Compliance with environmental commitments in supply chain	20
341. Traceability	4
342. Product life cycle assessment	4
343. Green codes for suppliers	4
344. Environmental management systems	4
345. Certifications and/or eco-labels	4

ECWI – Environmental Commitment Web Index

Source: Author's own elaboration based on Siano et al. (2016) and Kondoh et al. (2012)

<https://doi.org/10.17221/41/2025-AGRICECON>

Table 2. Definition and points of Environmental Commitment Web Index (ECWI) and its three dimensions (orientation, structure, content)

Categories	Points			
	ECWI 0 to 100	ECWI-O 0 to 10	ECWI-S 0 to 30	ECWI-C 0 to 60
Very good	≥ 80	≥ 8	≥ 24	> 48
Good	70 a 79	7	22 a 24	43 a 48
Acceptable	60 a 69	6	19 a 21	37 a 42
Poor	50 a 59	5	15 a 18	30 a 36
Very poor	< 50	< 5	< 15	< 30

Source: Author's own elaboration based on Siano et al. (2016) and Kondoh et al. (2012)

less than EUR 50 million, or possess assets of more than EUR 10 million and less than EUR 43 million. Evidently, larger corporations exceed the aforementioned parameters.

In order to calculate the ECWI and its dimensions in each of the Spanish wineries, a series of business information was required. This information was available in the database of the Iberian Balance Sheet Analysis System (SABI, <http://www.informa.es/es/soluciones-financieras/sabi>), which included 2 million Spanish companies in 2018 and 2.9 million in 2024. In 2018, the SABI database contained 2 621 registered wineries, of which 52.9% (1 383) had a website. In 2024, 4 270 wineries were registered in SABI, 43.8 % (1 872) of which had a website. The business characteristics of all large and medium-sized Spanish wineries obtained from SABI for both years are presented in Table 3. The business characteristics exhibited minimal variation between 2018 and 2024 by all large and medium-sized Spanish wineries under analysis. In view of the foregoing observations, it was

deemed appropriate to conduct a comprehensive examination of the websites of all large and medium-sized Spanish wineries in both 2018 and 2024.

In order to assess the reliability of the survey, the Cronbach's alpha coefficient based on standardised items was calculated at 0.807 for both 2018 and 2024. This finding fell within the acceptable range defined by Nunnally and Bernstein (1994), who recommend accuracies between 0.70 and 0.95, particularly given the study's small population size.

The data obtained from the websites was then analysed using the open-source software R v. 4.2.0 (2022, R Core Team). In order to ascertain the existence of SSDs in the variables under consideration with respect to business size, business model, provision of wine tourism and presence of an online store, the chi-squared test was employed for the qualitative variables. The presence of SSDs was established through the use of *P*-values, which was set at 0.05 for two groups, and for three groups at 0.016, with the Bonferroni correction applied.

Table 3. Ranking by business characteristics of all large and medium-sized Spanish wineries in 2018 and 2024 (%)

Size	Company model			Offer wine tourism on the web	Online shop on the web
	Plc.	Ltd.	Co-op	yes	yes
Large and medium					
2018: 69 wineries	53.6	34.8	11.6	65.2	60.9
2024: 72 wineries	47.2	41.7	11.1	59.7	70.8
Large (8.7%)					
2018: 6 wineries	83.3	0.0	16.7	66.7	50.0
2024: 6 wineries	83.3	16.7	0.0	100	83.3
Medium (92.3%)					
2018: 63 wineries	50.8	38.1	11.1	65.1	61.9
2024: 66 wineries	43.9	43.9	12.1	56.1	69.7

Source: Author's own elaboration

**RESULTS**

The following section is dedicated to the presentation of the findings derived from a model that has been developed for the purpose of investigating environmental commitment on the web. This model has been implemented in all large and medium-sized Spanish wineries, and the results are presented in three subsections. The results are then compared between the years 2018 and 2024. Firstly, a global analysis of the ECWI is performed. Secondly, each of the dimensions of the ECWI (ECWI-O, ECWI-S and ECWI-C) and its subdimensions are analysed. Thirdly, an analysis will be carried out of the differences of the ECWI and its dimensions among groups of companies organised by the following business characteristics: company

size, company type, the provision of wine tourism on the web and the existence of an online shop. A detailed discussion of the results is provided in each of the subsections.

**Analysis of the ECWI.** The environmental commitment of all large and medium-sized Spanish wineries analysed by means of the ECWI in 2018 showed an average value of 9.8 points (Figure 1). This is attributable to the fact that 98.5 % of the wineries were classified as being in the 'very poor' and 'poor' categories (Figure 2). In 2024, a substantial enhancement was observed in the ECWI, which exhibited a twofold increase compared to 2018, reaching an average value of 20.2 points (Figure 1). This is evidenced by the emergence of wineries within the 'very good' and 'good' categories (7.2%), accompanied by a decline in the proportion of wineries

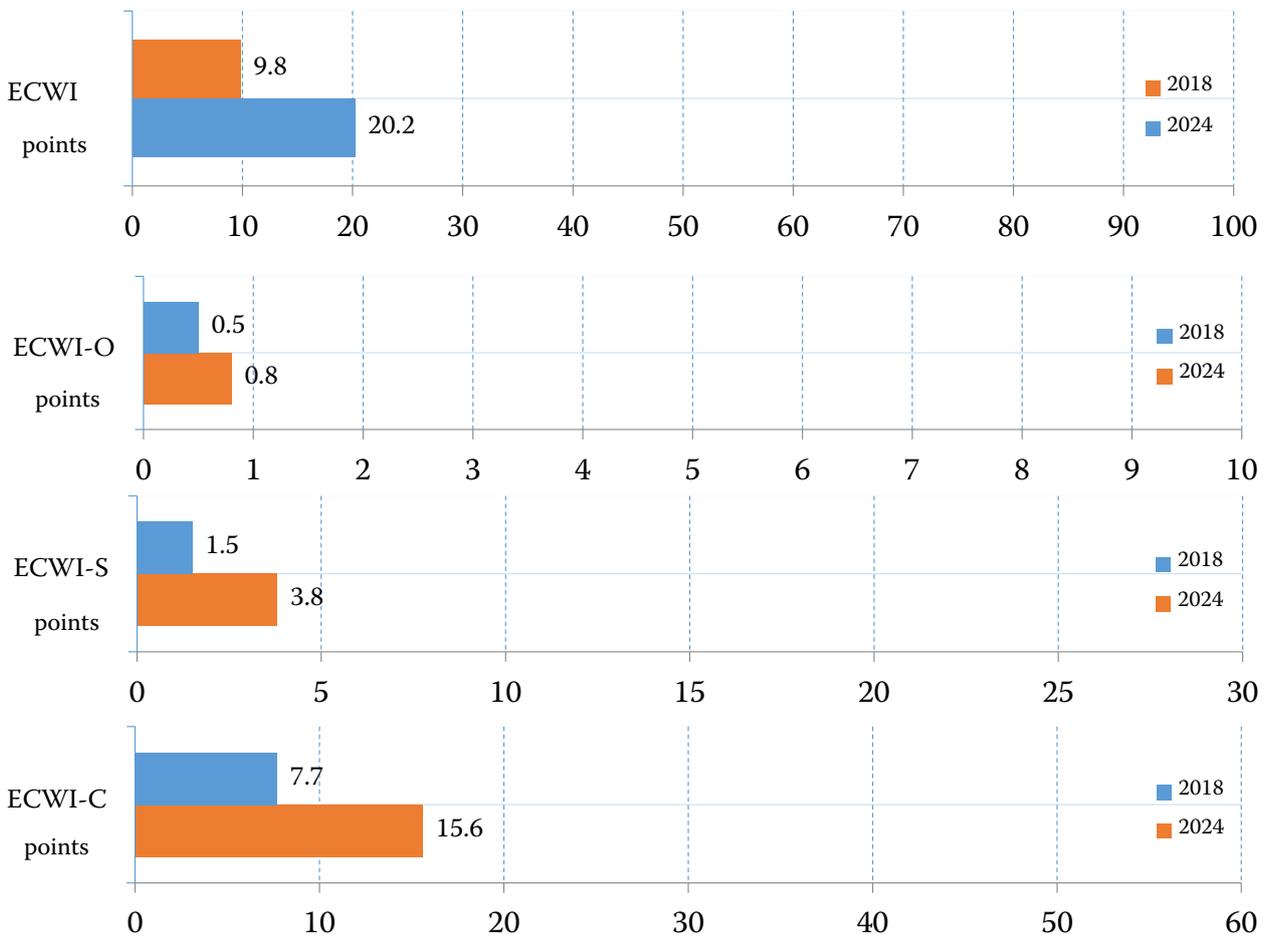


Figure 1. Environmental commitment of all large and medium-sized Spanish wineries through the ECWI and its dimensions points in 2018 and 2024

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively  
 Source: Author's own elaboration

<https://doi.org/10.17221/41/2025-AGRICECON>

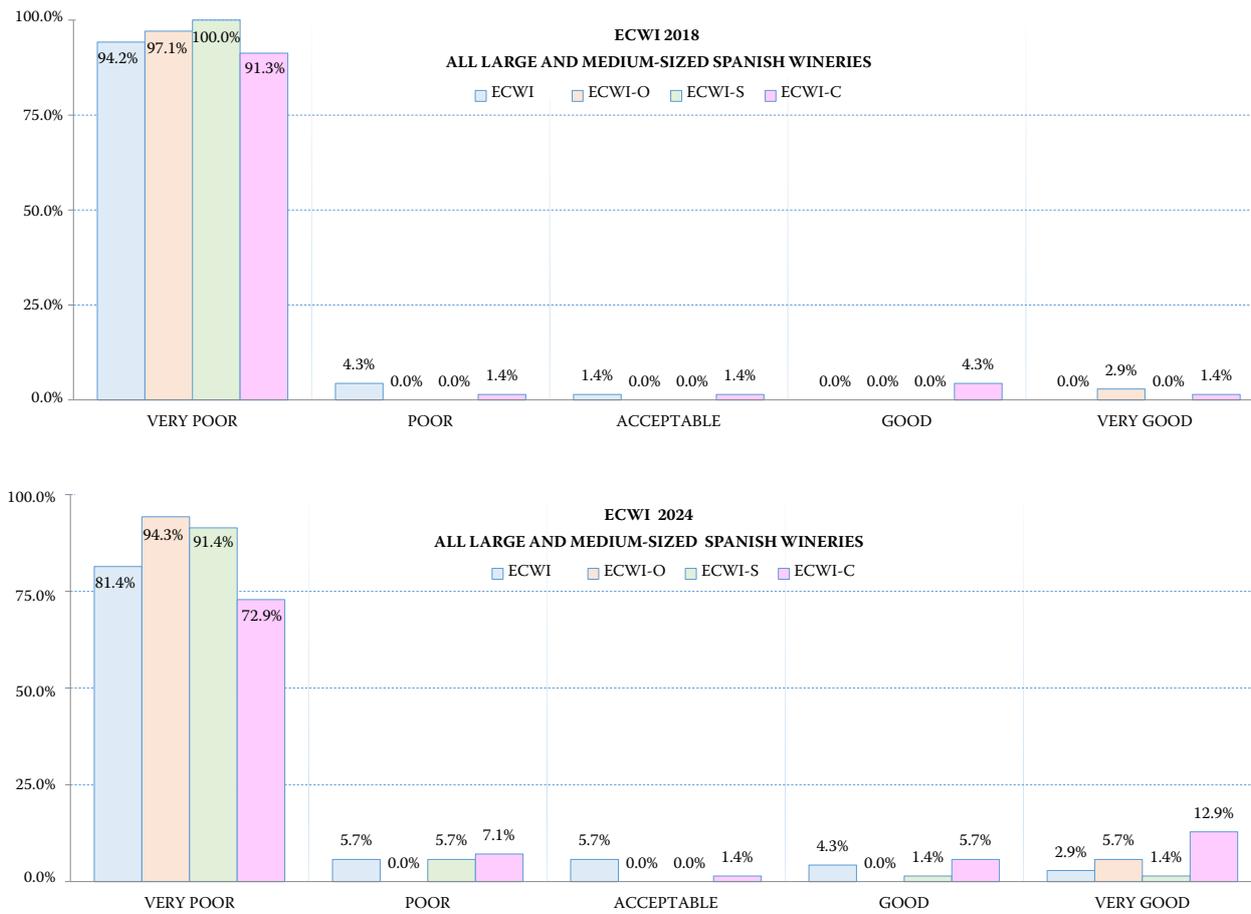


Figure 2. Classification of all large and medium-sized Spanish wineries in 2018 and 2024 in function of the ECWI and its dimensions

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively  
Source: Author's own elaboration

falling within the 'very poor' and 'poor' categories, which stood at 87.1% (Figure 2).

**Analysis of the ECWI dimensions and subdimensions.** The analysis of the three dimensions of the ECWI in all the wineries analysed in 2018 showed very low average values (Figure 1): The assessment is comprised of three distinct components, namely orientation (ECWI-O of 0.5 points), structure (ECWI-S of 1.5 points), and content (ECWI-C of 7.7 points). This finding lends further support to the notion that a significant proportion exhibited a minimal degree of environmental commitment, as evidenced by their classification in the 'very poor' category, with 97.1% of ECWI-O, 100% of ECWI-S and 91.3% of ECWI-C (Figure 2). In contrast, the analysis of the three components of the ECWI in 2024 shows a slight increase compared to 2018 by doubling the average values

in ECWI-S (3.8 points) and ECWI-C (15.6 points), and with an expansion of 50% in ECWI-O (0.8 points) (Figure 1). However, the majority of the wineries are still able to maintain a position within the 'very poor' category across all three components: the data indicates that 94.3% of the ECWI-O sample, 91.4% of the ECWI-S sample and 72.9% of the ECWI-C sample were positive (Figure 2).

In the orientation dimension, the ECWI-O average value in 2018 was 0.5 points (Figure 1), and the majority of all the wineries analysed (97.1%) were classified as 'very poor' (Figure 2). This is determined by the fact that only a small number made explicit reference to environmental commitment in their subdimension 11 'Mission' (4.3%) and subdimension 12 'Vision' (5.8%, Figure 3). By 2024, a marginal enhancement was observed, with a substantial decrease in the

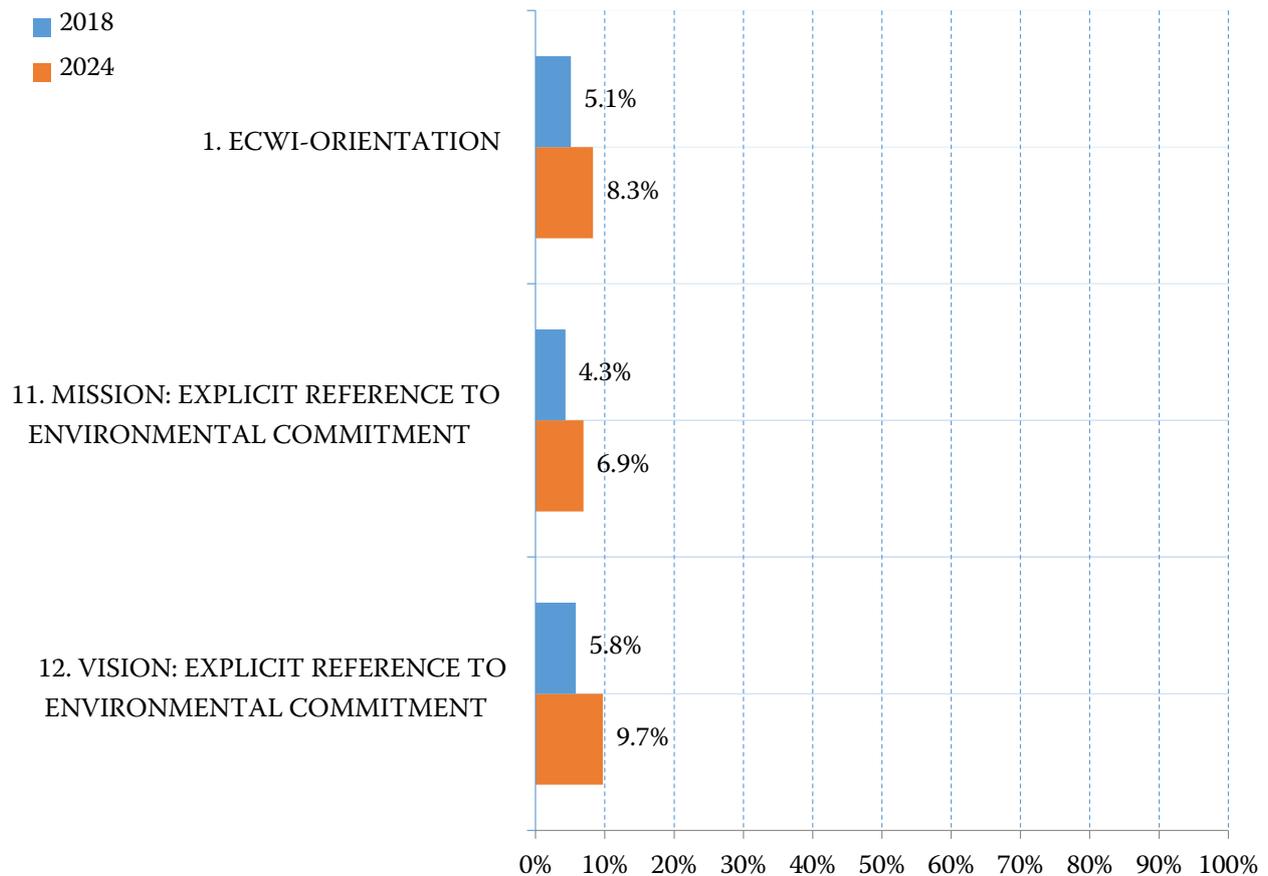


Figure 3. Percentage of compliance with the ECWI-Orientation dimension and its subdimensions of all large and medium-sized Spanish wineries in 2018 and 2024

ECWI – Environmental Commitment Web Index

Source: Author's own elaboration

number of wineries categorised as 'very poor' (94.3%, Figure 2). This can be attributed to an increase in compliance, which reaches 6.9% in subdimension 11 'Mission' and 9.7% in subdimension 12 'Vision' (Figure 3).

With regard to the Structure Dimension, the ECWI-S average value for 2018 was 1.5 points (Figure 1), and all the wineries analysed were classified within the 'very poor' category (Figure 2), given that they comply with only 6.9% of the items (Figure 4). However, by 2024, a marked increase in the ECWI-S average value was observed, reaching 3.8 points (Figure 1), and compliance also increased to 14.4%. The data indicate that the proportion of wineries categorised as 'very poor' decreased to 91.4% (Figure 2). With regard to the relative importance of the subdimensions within this dimension, in 2018 subdimension 23, entitled 'Corporate identity tool for environmental governance', was the subdimension

with the highest level of compliance, present in 15% of wineries' websites (Figure 4). In 2024, the same ranking of subdimensions was maintained, but with a significant intensification in all of them, with subdimension 23 'Corporate identity tool for environmental governance' at 25.5% (Figure 4).

With respect to the content, the ECWI-C in 2018 indicates that 92.7% of all the wineries analysed were classified as 'poor' or 'very poor' and the 6.1% as 'good' or 'very good' (Figure 2), with a compliance rate of 13.2% (Figure 5). By the year 2024, the degree of compliance had doubled to 27.1% (Figure 5), which implied a decrease to 80.0% in the 'poor' and 'very poor' categories and an increase to 18.6% in the 'good' and 'very good' categories (Figure 2). With regard to the significance of the four subdimensions within this dimension, a high degree of compliance with items by wineries is demonstrated in comparison

<https://doi.org/10.17221/41/2025-AGRICECON>

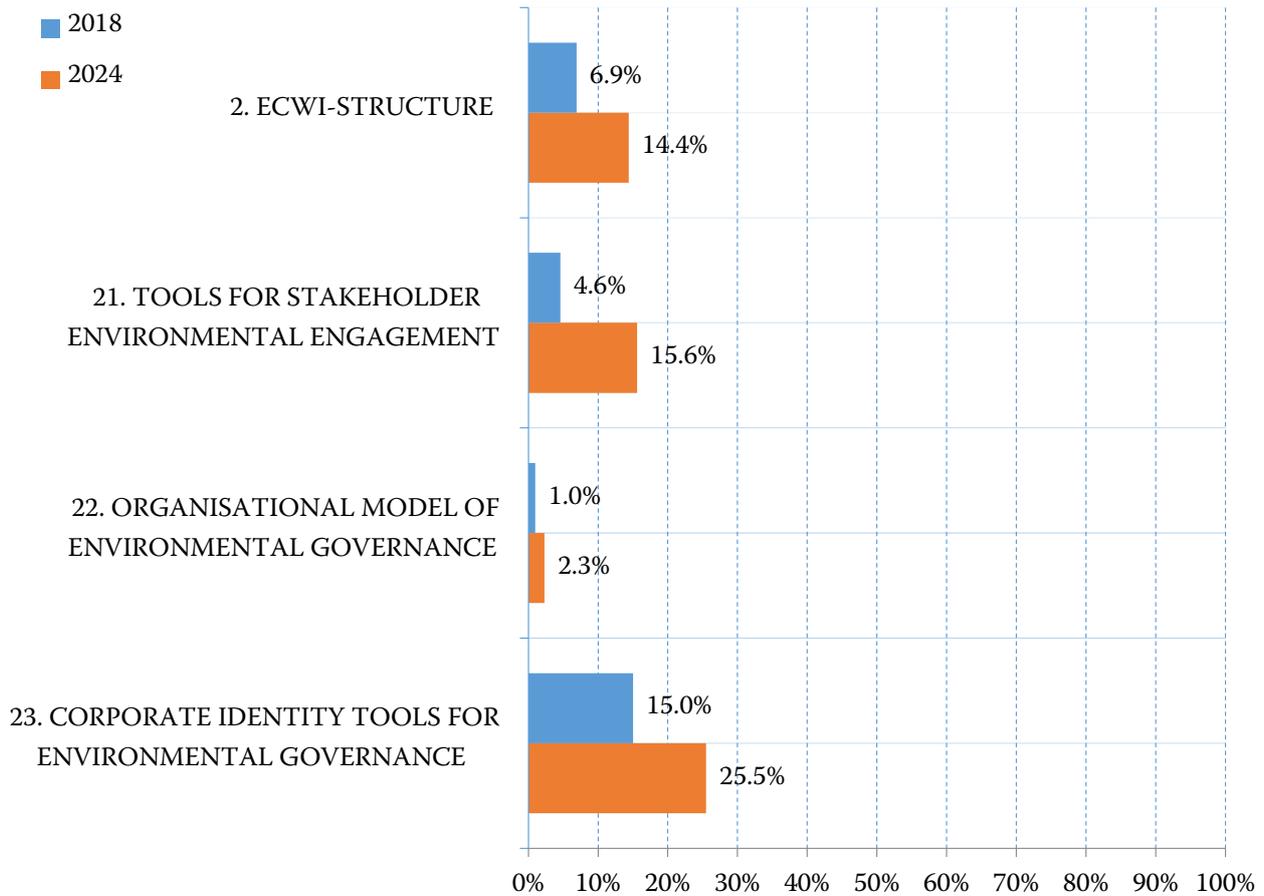


Figure 4. Percentage of compliance with the ECWI-Structure dimension and its subdimensions of all large and medium-sized Spanish wineries in 2018 and 2024

ECWI – Environmental Commitment Web Index  
 Source: Author's own elaboration

to the other subdimensions of the model. It is evident that between 2018 and 2024, there was a substantial augmentation in this compliance, which attained a value that was double that of 2018. However, this increase gave way to alterations in the order of importance of the subdimensions between these two years (Figure 5). Consequently, in 2018, the two most significant subdimensions that exhibited analogous values were subdimension 33, 'Environmental practices', with 15.2%, and subdimension 31, 'Environmental initiatives', with 13.5%. The remaining two subdimensions, subdimension 32, 'Environmental visibility' and subdimension 34, 'Compliance with environmental commitments in the supply chain', also exhibit similar values of 12.1% and 11.9%, respectively. Conversely, in 2024, there were notable shifts in the relative importance of the aforementioned groups. As indicated by the data, a shift in the

relative importance of the initial two subdimensions was evident. The subdimension entitled 'Environmental initiatives' was the most significant in terms of degree of compliance, with a percentage of 31.9%. This was followed by the subdimension 'Environmental practices', which accounted for 29.5%. In the second group, the order was also changed with subdimension 34, 'Compliance with environmental commitments in the supply chain', which exhibited a 23.6% degree of compliance, and subdimension 32, 'Environmental visibility', which exhibited a 23.1% degree of compliance.

**Analysis of the differences in the ECWI dimensions according to company characteristics.** In 2018, an absence of SSDs was observed between all large and medium wineries in both the ECWI and its dimensions when grouped by size into two categories: large and medium (Table 4). However,

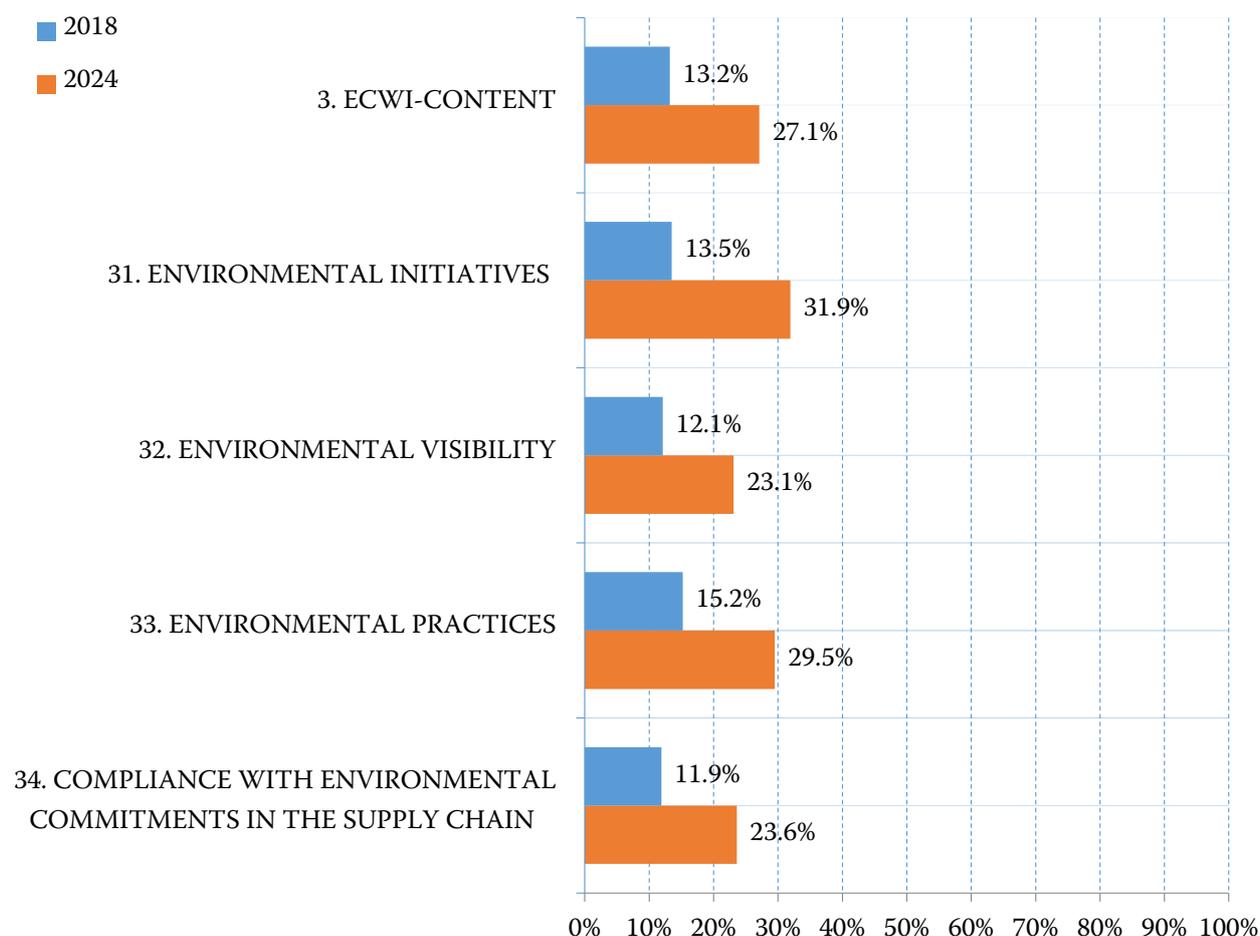


Figure 5. Percentage of compliance with the ECWI-Content dimension and its subdimensions of all large and medium-sized Spanish wineries in 2018 and 2024

Source: Author's own elaboration

in the year 2024, SSDs were identified in the ECWI and in the ECWI-S and ECWI-C dimensions (Table 4 and Figure 6), with superior values for large wineries in comparison to medium ones. Consequently, in the 2024 ECWI, the proportion of large

wineries classified as 'very poor' or 'poor' was 50.0%, compared to 90.9% of medium wineries. Within the 'very good' and 'good' categories, the proportion of large wineries was noted at 50.0%, whereas the figure for medium ones was recorded at only 3.0%.

Table 4. Statistically significant differences (SSD) grouping by company size (large or medium) on all large and medium-sized Spanish wineries in 2018 and 2024

SSD large vs medium	P-value $\chi^2$			
	ECWI	ECWI-O	ECWI-S	ECWI-C
2018	0.291	0.280	**C	0.127
2024	0.000*	0.116	0.005*	0.029*

\*significance level at 0.05; \*\*C: no P-value as it is constant

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively

Source: Author's own elaboration

<https://doi.org/10.17221/41/2025-AGRICECON>

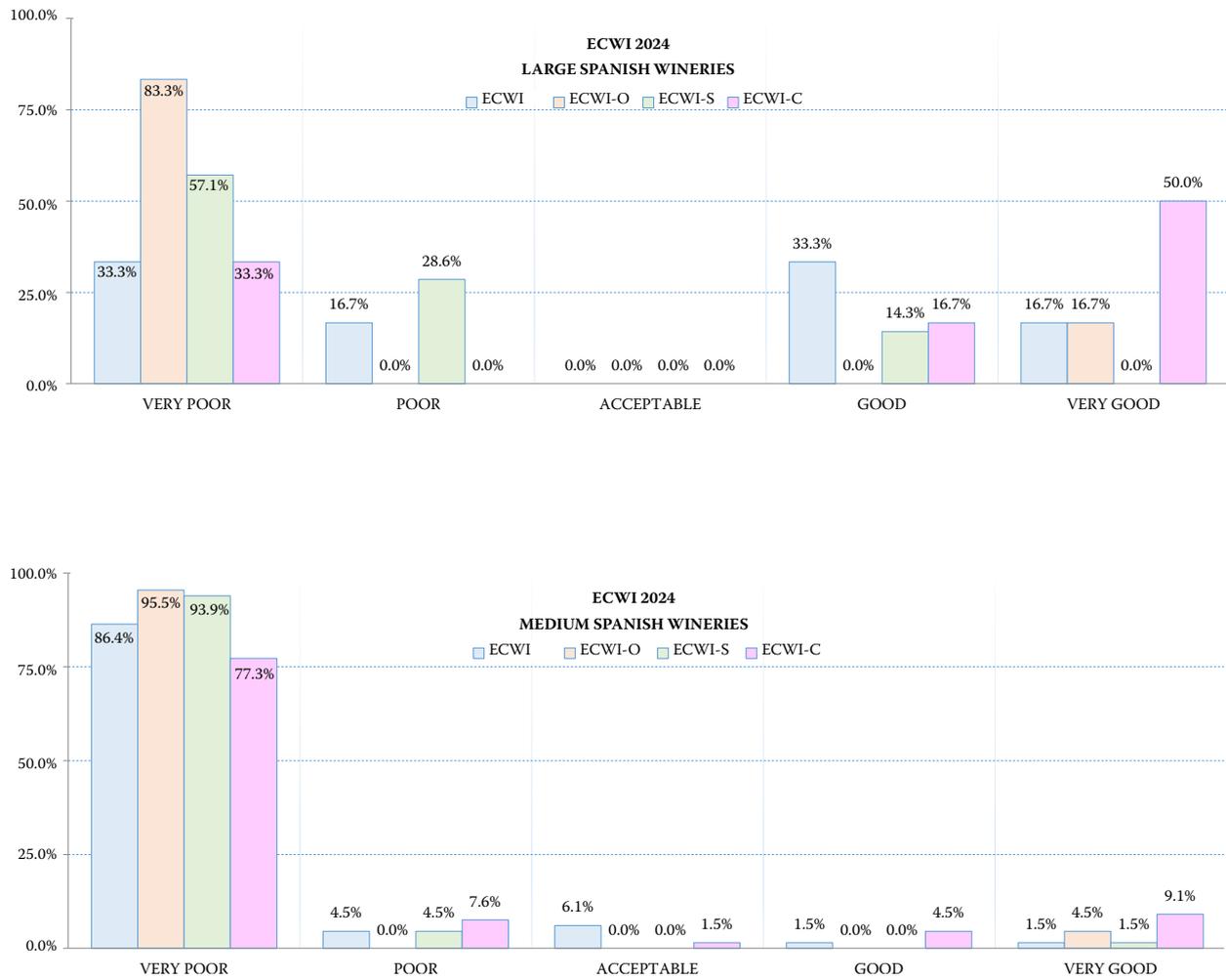


Figure 6. Classification of all large and medium-sized Spanish wineries in function of the ECWI and its dimensions ECWI grouping by size of business (large or medium) in 2024

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively  
 Source: Author's own elaboration

In contrast, in the ECWI-S of 2024, 14.3% of large wineries were rated as 'very good' or 'good', compared to a mere 1.5% of medium ones. Furthermore, a maximum of 57.1% of large wineries were in the 'very poor' category, in contrast to the 93.9% of medium ones that fell into this category. In the 2024 ECWI-C, large wineries accounted for 66.7% in the 'very good' and 'good' categories, in comparison to 13.6% of medium ones.

The analysis did not reveal the presence of SSDs in any of the examined years (2018 and 2024) between large and medium-sized Spanish wineries groups, neither within the ECWI nor across any of its dimensions

when the wineries were grouped based on their company type (Plc., Ltd. and Co-op, Table 5).

As was the case in the preceding instance, in none of the years under consideration (2018 and 2024) were SSDs observed on all the large and medium-sized Spanish wineries, neither in the ECWI nor in any of its dimensions when grouping by whether or not they offer wine tourism on the web (Table 6).

As in the two preceding cases, in none of the years analysed (2018 and 2024) were SSDs perceived on all large and medium wineries, neither in the ECWI nor in any of its dimensions were grouped by whether or not they have an online shop (Table 7).

<https://doi.org/10.17221/41/2025-AGRICECON>

Table 5. Statistically significant differences (SSD) grouping by company type (Plc., Ltd. and Co-op) on all large and medium-sized Spanish wineries in 2018 and 2024

SSD Plc. vs Ltd. vs Co-op	P-value $\chi^2$			
	ECWI	ECWI-O	ECWI-S	ECWI-C
2018	0.669	0.364	**C	0.644
2024	0.751	0.270	0.667	0.135

\*\*C: no *P*-value as it is constant

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively

Source: Author's own elaboration.

Table 6. Statistically significant differences (SSD) grouping by companies that offer or not wine tourism on the web on all large and medium-sized Spanish wineries in 2018 and 2024

SSD Offer wine tourism on web	P-value $\chi^2$			
	ECWI-O	ECWI-S	ECWI-C	ECWI-C
2018	0.175	0.398	**C	0.376
2024	0.102	0.573	0.220	0.147

\*\*C: no *P*-value as it is constant

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively

Source: Author's own elaboration

Table 7. Statistically significant differences (SSD) grouping by companies that have or not an online shop on the web on all large and medium-sized Spanish wineries in 2018 and 2024

SSD Have online shop on web	P-value $\chi^2$			
	ECWI	ECWI-O	ECWI-S	ECWI-C
2018	0.703	0.500	**C	0.833
2024	0.198	0.112	0.210	0.547

\*\*C: no *P*-value as it is constant

ECWI – Environmental Commitment Web Index; -O, -S, -C – orientation, structure, content dimensions, respectively

Source: Author's own elaboration

## DISCUSSION

As stated by Muriel et al. (2025), there is a scarcity of literature examining how agribusinesses communicate sustainability practices through their published sustainability reports. Consequently, the present discussion focuses on those few previous studies and the relevant insights provided by the authors.

The developed model presented in this article constitutes a valuable instrument for the evaluation of the environmental commitment of agri-food companies. The model is based on objective information regarding their environmental activities displayed on their websites. The index employed for the assessment is the ECWI, which is comprised of three dimensions: Orientation (ECWI-O), Structure (ECWI-S) and Content (ECWI-C).

The application of the model to all large and medium-sized Spanish wineries indicates an enhancement in their environmental commitment during the period 2018–2024. This observation is consistent with the findings of Heinze and Heinze (2023), who observed an increase in CSR initiatives among companies across all industries over a more than a decadal period. A similar trend is evident in the case of all large and medium Spanish wineries, which have also increased their environmental commitment to double between 2018 and 2024 based on the ECWI value. However, the majority of these wineries have been found to demonstrate a 'very poor' environmental commitment during that period, in a similar way to the Italian wine companies (Bertorelli et al. 2023). These results are consistent with those reported by Topp-Becker and

<https://doi.org/10.17221/41/2025-AGRICECON>

Ellis (2017), who concluded that sustainability reporting was not a priority for all companies in the agricultural supply chain, as is the case with wineries.

The observed increase in the ECWI is attributed mainly to the initiatives undertaken by the wineries in the contents dimension (ECWI-C), encompassing advancements in environmental initiatives, enhanced visibility, practices and compliance. ECWI-C is followed in importance by the structure dimension (ECWI-S), and, to a lesser extent, by the orientation dimension (ECWI-O).

With regard to ECWI-O, it is noteworthy that the level of compliance is surprisingly low, given the ease with which it can be achieved. In order to demonstrate their commitment to environmental issues, wineries would merely be required to make an explicit statement in their mission and vision. However, a significant problem arises from the fact that very few wineries have defined and published their mission and vision.

The ECWI-S demonstrates considerable scope for enhancement, particularly in the domain of environmental governance. The development of an organisational model to address these issues is imperative, with the potential to result in an increase in compliance and a substantial augmentation in the ECWI-S. A strategic allocation of human resources to environmental governance could further reinforce the model. Furthermore, the implementation of these human resources could result in a swift escalation of the tools for stakeholder environmental engagement and for the corporate identity tool for environmental governance.

The ECWI-C demonstrates the highest level of compliance across all its subdimensions, and also exhibits an enhancement in compliance, amounting to a doubling over a six-year period. This enhancement can be attributed to the ease with which it can be further improved. Consequently, if there is an increase in human resources dedicated to environmental commitment, as has been suggested above, this dimension will improve rapidly.

The environmental commitment exhibited by all large and medium Spanish wineries on their websites appeared to be solely influenced by their size. The type of company, the presence of wine tourism, and online sales were found to have no influence on the outcome. It is evident that the magnitude of the wineries is correlated with their environmental commitment, which exhibits an incremental rise over time due to the enhancement in the environmental performance of large wineries. It is possible that this may be a consequence of the formal obligations imposed on them by Directive

2014/95/EU (the Non-Financial Reporting Directive, NFRD), which was transposed into Spanish law through the enactment of Law 11/2018. However, it is expected that medium wineries will gradually incorporate the NFRD into their management, thereby improving their ECWI. Furthermore, the heightened environmental commitment exhibited by prominent Spanish wineries, in comparison to their medium counterparts, serves to corroborate the findings of Conca et al. (2021), who suggested that enhanced transparency and accountability are instrumental in optimising business profitability, a quality that is more pronounced in large wineries.

Martos-Pedrero et al. (2019) conducted a research study encompassing 107 agri-food companies in south-eastern Spain, which concluded that CSR exerts a positive influence on financial performance, enhances the volume and performance of exports, impacts corporate image and reputation in a favourable manner, and elevates the level of satisfaction among relevant stakeholders. The present study corroborates these findings, thereby substantiating the primary recommendation that, in order to be recognised as environmentally committed companies by consumers and stakeholders, they must implement substantial enhancements in their web-based communication of environmental issues.

The principal limitation of this research is that it has focused exclusively on large and medium-sized Spanish wineries. However, the prevalence of small wineries, and the fact that not all of them have a website, led us to conduct a more limited analysis. Nevertheless, the results indicate the trends shown by Spanish wineries in an issue as important for them today as environmental commitment within the context of CSR and NFRD. Consequently, this study can be used as a basis for future research in any group of agri-food companies.

The subsequent phase of research will concentrate on the application of the model to additional groups of companies within the agri-food sector. Furthermore, dynamic studies will be conducted over time to determine how environmental commitment is communicated through company websites.

## CONCLUSION

This article proposes a model for evaluating the environmental commitment of agri-food companies. The model is based on objective information about their environmental activities displayed on their websites. The model under consideration comprises three dimensions, nine subdimensions and 33 items. The combination of these elements with predetermined

points facilitates the calculation of ECWI, a metric that assesses the environmental commitment of agri-food companies across three dimensions: The following three factors must be considered: orientation (ECWI-O), structure (ECWI-S) and content (ECWI-C).

The application of this approach to the case of all large and medium-sized Spanish wineries demonstrates that their environmental commitment, evidenced on their objective information of their website, was, according to the ECWI index, 'very poor' in both 2018 and 2024 for 94.2% and 81.4% of the wineries, respectively. However, a notable increase was observed between these two periods, with the average ECWI value increasing from 9.8 points in 2018 to 20.2 points in 2024. In the Orientation Dimension, ECWI-O categorised 97.1% of the wineries in 2018 and 94.3% in 2024 as 'very poor'. In the Structure Dimension, all of the wineries analysed in 2018 were included in the 'very poor' category of the ECWI-S, and in 2024 there was a very slight enhancement to 91.4% in that category. Finally, with regard to the Orientation Dimension, the ECWI-O encompasses 97.1% of the wineries in the 'very poor' category in 2018, and with a decline to 94.3% in that category in 2024. With respect to the differences in the ECWI and its dimensions (ECWI-O, ECWI-S and ECWI-C), when grouped wineries according to business characteristics, it was only in the case of size groups (large vs. medium) that SSDs were identified in the ECWI, ECWI-S and ECWI-C. In the subsequent analysis, based on company type, the presence of wine tourism offerings on the website, or the presence of an online shop on the website, no SSDs were identified.

In conclusion, the tool developed in this article enables the evaluation of the level of environmental commitment of the agri-food companies through the objective information shown on their website. The validity of this hypothesis was confirmed through analysis of all large and medium Spanish-sized wineries. The analysis indicates that they must overcome the current situation of inadequate communication regarding their environmental commitment, although the improvement in the indexes between 2018 and 2024 reflects an increased awareness among wineries about communicating their environmental commitment. It is recommended that wine producers should increase their efforts to communicate their environmental activities on their websites, including both those that are already being implemented and those that are planned for the future. In order to achieve the aforementioned objective, it is imperative for the wineries to pay a particular attention to the issue, through the increased dedication of human resources dedicated to the subject.

## REFERENCES

- Abbas J., Dogan E. (2022): The impacts of organizational green culture and corporate social responsibility on employees' responsible behaviour towards the society. *Environmental Science and Pollution Research*, 29: 60024–60034.
- Albertini E. (2013): Does environmental management improve financial performance? A meta-analytical review. *Organization & Environment*, 26: 431–457.
- Aljarah A., Ibrahim B. (2020): The robustness of corporate social responsibility and brand loyalty relation: A meta-analytic examination. *Journal of Promotion Management*, 26: 1038–1072.
- Anguiano-Santos C., Rodríguez-Entrena M. (2024): Sustainability reporting in focus: Analysing Spanish transposition of the Non-Financial Reporting European Directive in the agri-food sector. *Agricultural and Food Economics*. 12: 10.
- Barauskaite G., Streimikiene D. (2021): Corporate social responsibility and financial performance of companies: The puzzle of concepts, definitions and assessment methods. *Corporate Social Responsibility and Environmental Management*, 28: 278–287.
- Bertorelli S., Gubelli S., Bramanti V., Capri E., Lamastra L. (2023): How does the wine sector perform and communicate sustainability? The Italian Case. *Sustainability*, 15: 12700.
- Buil P., Sanjurjo-San Martin E.L., Alfaro-Tanco J.A. (2024): Dissemination analysis of SDGs in sustainability reports to enhance corporate communication strategy. *Cuadernos de Gestión*, 24: 73–84.
- Caputo F., Pizzi S., Ligorio L., Leopizzi R. (2021): Enhancing environmental information transparency through corporate social responsibility reporting regulation. *Business Strategy and the Environment*, 30: 3470–3484.
- Carroll A.B. (2021): Corporate social responsibility: Perspectives on the CSR construct's development and future. *Business & Society*, 60: 1258–1278.
- Chaudhary R. (2017): Corporate social responsibility and employee engagement: Can CSR help in redressing the engagement gap? *Social Responsibility Journal*, 13: 323–338.
- Chen P., Dagestani A.A. (2023): Greenwashing behavior and firm value – From the perspective of board characteristics. *Corporate Social Responsibility and Environmental Management*, 30: 2330–2343.
- Chia A., Kern M.L., Neville B.A. (2020): CSR for Happiness: Corporate determinants of societal happiness as social responsibility. *Business Ethics, the Environment and Responsibility*, 29: 422–437.
- Conca L., Manta F., Morrone D., Toma P. (2021): The impact of direct environmental, social, and governance reporting: Empirical evidence in European-listed companies in the

<https://doi.org/10.17221/41/2025-AGRICECON>

- agri-food sector. *Business Strategic and the Environment*, 30: 1080–1093.
- De Freitas Netto S.V., Sobral M.F.F., Bezerra Ribeiro A.R., da Luz Soares G.R. (2020): Concepts and forms of green-washing: A systematic review. *Environmental Sciences Europe*, 32: 19.
- Doan M.H., Sassen R. (2020): The relationship between environmental performance and environmental disclosure: A meta-analysis. *Journal of Industrial Ecology*, 24: 1140–1157.
- EC (European Commission) (2019): *Corporate Social Responsibility, Responsible Business Conduct, and Business & Human Rights*. Brussels, European Commission. Available at <https://ec.europa.eu/docsroom/documents/34963>
- EC (European Commission) (2022): *Corporate Sustainability and Responsibility*. Brussels, European Commission. Available at [https://single-market-economy.ec.europa.eu/industry/sustainability/corporate-social-responsibility-responsible-business-conduct\\_en](https://single-market-economy.ec.europa.eu/industry/sustainability/corporate-social-responsibility-responsible-business-conduct_en)
- Echanove Franco A. (2020): Marco de referencia para la integración de la contabilidad social en la gestión estratégica de las empresas de Economía Social. *CIRIEC – España, Revista de Economía Pública, Social y Cooperativa*, 100: 207–237. (in Spanish)
- Erauskin-Tolosa A., Zubeltzu-Jaka E., Heras-Saizarbitoria I., Boiral O. (2020): ISO 14001, EMAS and environmental performance: A meta-analysis. *Business Strategy and the Environment*, 29: 1145–1159.
- Fang C., Zhang J. (2018): Performance of green supply chain management: A systematic review and meta-analysis. *Journal of Cleaner Production*, 183: 1064–1081.
- Feng G., Long H., Wang H., Chang C.P. (2022): Environmental, social and governance, corporate social responsibility, and stock returns: What are the short- and long-run relationships? *Corporate Social Responsibility and Environmental Management*, 29: 1884–1895.
- Fontoura Y., Zareen B., Steffen B. (2016): A transnational agri-food system for whom? The struggle for hegemony at Rio+20. *Revista de Administracao de Empresas*, 56: 424–437.
- Govindan K., Rajeev A., Padhi S.S., Pati R.K. (2020): Supply chain sustainability and performance of firms: A meta-analysis of the literature. *Transportation Research Part E: Logistics and Transportation Review*, 137: 101923.
- Heinze T., Heinze N. (2023): Sustainability practices and promotion: Websites of large US companies, part II. *International Journal of Global Environmental Issues*, 22: 46–59.
- Iglesias O., Markovic S., Bagherzadeh M., Singh J.J. (2020): Co-creation: A key link between corporate social responsibility, customer trust, and customer loyalty. *Journal of Business Ethics*, 163: 151–166.
- Kondoh S., Kurakwa K., Kato S., Umeda Y., Takata S. (2012): Analysis of key success factors for eco-business through case studies in Japan. *International Journal of Automation Technology*, 6: 252–263.
- Le T.T. (2023): Corporate social responsibility and SMEs' performance: Mediating role of corporate image, corporate reputation and customer loyalty. *International Journal of Emerging Markets*, 18: 4565–4590.
- López-Becerra E., Arcas-Larios N., Alcón F. (2016): The websites adoption in the Spanish agrifood firms. *Spanish Journal of Agricultural Research*, 14: e0107.
- López B., Rangel C., Fernández M. (2022): The impact of corporate social responsibility strategy on the management and governance axis for sustainable growth. *Journal of Business Research*, 150: 690–698.
- Lu J., Liang M., Zhang C., Rong D., Guan H., Mazeikaite K., Streimikis J. (2021): Assessment of corporate social responsibility by addressing sustainable development goals. *Corporate Social Responsibility and Environmental Management*, 28: 686–703.
- Luo J., Ji C., Qiu C., Jia F. (2018): Agri-food supply chain management: Bibliometric and content analyses. *Sustainability*, 10: 1573.
- MAPA (2023): *Informe Anual de Indicadores 2022*. Madrid, Ministerio de Agricultura, Pesca y Alimentación de España. (in Spanish)
- Martos-Pedrero A., Cortés-García F.J., Jiménez-Castillo D. (2019): The relationship between social responsibility and business performance: An analysis of the agri-food sector of southeast Spain. *Sustainability*, 11: 6390.
- Muriel M.J., Larrán M., Andrades J., Calzado M.Y. (2025): Sustainability information disclosure in the agri-food sector: A systematic literature review. *British Food Journal*, 127: 3041–3072.
- Newman C., Rand J., Tarp E., Trifkovic N. (2020): Corporate social responsibility in a competitive business environment. *The Journal of Development Studies*, 56: 1455–1472.
- Nunnally J.C., Bernstein I.H. (1994). *Psychometric Theory*. Columbus, McGraw-Hill: 248–292.
- OIV (International Organisation of Vine and Wine) (2024): *State of the World Vine and Wine Sector in 2023*. Dijon, OIV. Available at [https://www.oiv.int/sites/default/files/2024-04/OIV\\_STATE\\_OF\\_THE\\_WORLD\\_VINE\\_AND\\_WINE\\_SECTOR\\_IN\\_2023.pdf](https://www.oiv.int/sites/default/files/2024-04/OIV_STATE_OF_THE_WORLD_VINE_AND_WINE_SECTOR_IN_2023.pdf)
- ORSC (2017): *Observatorio de Responsabilidad Social Corporativa*. Madrid, ORSC. Available at <http://observatorio-sc.org/la-rsc-que-es/> (accessed April 25, 2017).
- Padilla-Lozano C.P., Collazzo P. (2022): Corporate social responsibility, green innovation and competitiveness – Causality in manufacturing. *Competitiveness Review*, 32: 21–39.

<https://doi.org/10.17221/41/2025-AGRICECON>

- Pan X., Sinha P., Chen X. (2021): Corporate social responsibility and eco-innovation: The triple bottom line perspective. *Corporate Social Responsibility and Environmental Management*, 28: 214–228.
- Paruzel A., Schmidt L., Maier G.W. (2023): Corporate social responsibility and employee innovative behaviors: A meta-analysis. *Journal of Cleaner Production*, 393: 136189.
- Porter M.E. (1991): America's green strategy. *Scientific American* 264: 168.
- Sánchez-Torné I., Morán-Álvarez J.C., Pérez-López J.A. (2020): The importance of corporate social responsibility in achieving high corporate reputation. *Corporate Social Responsibility and Environmental Management*, 27: 2692–2700.
- Schiessl D., Korelo J.C., Mussi Szabo Cherobim A.P. (2022): Corporate social responsibility and the impact on economic value added: The role of environmental innovation. *European Business Review*, 34: 396–410.
- Siano A., Conte F., Amabile S., Vollero A., Picicocchi P. (2016): Communicating sustainability: An operational model for evaluating corporate websites. *Sustainability*, 8: 950.
- Thanetsunthorn N. (2022): Corruption and social trust: The role of corporate social responsibility. *Business Ethics, the Environment & Responsibility*, 31: 49–79.
- Topp-Becker J., Ellis J.D. (2017): The role of sustainability reporting in the agri-food supply chain. *Journal of Agriculture and Environmental Sciences*, 6: 17–29.
- Uyar A., Karaman A.S., Kilic M. (2020): Is corporate social responsibility reporting a tool of signaling or greenwashing? Evidence from the worldwide logistics sector. *Journal of Cleaner Production*, 253: 119997.
- Vergragt P.J., Brown H.S. (2008): Genetic engineering in agriculture: New approaches for risk management through sustainability reporting. *Technological Forecasting and Social Change*, 75: 783–798.
- Vu D.M., Ha N.T., Ngo T.V.N., Pham H.T., Duong C.D. (2022): Environmental corporate social responsibility initiatives and green purchase intention: An application of the extended theory of planned behavior. *Social Responsibility Journal*, 18: 1627–1645.
- Wichianrak J., Wong K., Khan T., Siriwardhane P., Delaportas S. (2022): Soft law, institutional signalling – Thai corporate environmental disclosures. *Social Responsibility Journal*, 18: 205–220.

Received: January 27, 2025

Accepted: November 4, 2025

Published online: March 23, 2026