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Assessment of Sustainability Reporting from the EU Taxonomy Perspective: Evidence from Food-Processing Companies in the Visegrad Group

ABSTRACT

This study assesses the sustainability reporting practices of large food-processing companies in the Visegrad countries from the perspective of the EU Taxonomy. The analysis covers the 2021–2023 period, during the transition from the Non-Financial Reporting Directive (NFRD) to the Corporate Sustainability Reporting Directive (CSRD). Using a qualitative content analysis and a relative scoring method based on the six environmental objectives and 33 related activities defined in Regulation (EU) 2020/852, we evaluate both the occurrence and quality of disclosed sustainability information. The sample includes large companies representing more than half of sectoral financial indicators in each country. Results show that climate change mitigation receives the highest relative scores across all countries, followed by sustainable water use, biodiversity protection, and circular economy objectives, while climate adaptation and pollution prevention remain less developed. Mandatory reports consistently outperform voluntary ones in quality. The findings highlight both sector-specific sustainability priorities and the significant role of regulatory requirements in enhancing transparency and comparability in sustainability reporting across Central Europe.

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Introduction

The European Union's green ambitions build on major international and EU-level initiatives, including the UN Sustainable Development Goals, the Paris Agreement, ESG frameworks, CSR practices, and the European Green Deal. Green finance is central to achieving these objectives, making the EU Taxonomy (Regulation 2020/852; EP, 2020) a critical tool for defining environmentally sustainable economic activities, enhancing transparency, and preventing greenwashing.

The Corporate Sustainability Reporting Directive (Directive 2022/2464/EU) significantly expands upon its predecessor, the NonFinancial Reporting Directive (NFRD, 2014/95/EU, EP, 2014), which initially required large public-interest entities with over 500 employees to disclose nonfinancial information. The CSRD, in force since January 2023, broadens the scope and depth of sustainability reporting, originally phasing requirements for different groups of companies, including large companies, listed SMEs, and non-EU undertakings operating in the EU. However, the 2025 Omnibus package introduces substantial adjustments (EC, 2025). Its "stop-the-clock" directive delays the reporting obligation by two years, proposes permanently limiting mandatory CSRD reporting to companies with more than 1,000 employees and either EUR 50 million in net turnover or a EUR 25 million

balance sheet total, and proposes simplification in reporting requirements. These changes aim to reduce administrative burdens and enhance competitiveness while maintaining the EU's sustainability objectives. However, the EU Taxonomy remains foundational by establishing uniform criteria for what is considered environmentally sustainable, thereby supporting investor confidence and harmonising sustainability disclosures across Member States.

Despite their undeniable importance, sustainability efforts in the food-processing sector have received relatively little attention in international research and literature. Our study aims to contribute to the assessment of the green transition of the food-processing sector by examining the sustainability reporting practices and providing new comparative evidence on how Central European companies implement sustainability reporting in the food-processing sector. In this context, we study the extent to which large companies published sustainability documents in the period 2021–2023, before the disclosure requirements set out in the Corporate Sustainability Reporting Directive (CSRD) came into force. The main objective of our research is to examine the occurrence of environmental objectives and related sustainable activities defined in the Taxonomy Regulation in sustainability documents and to assess the quality of the published information using a scoring method developed for this purpose.

It is important to emphasise that our study does not aim to assess legal compliance with the EU Taxonomy, which is linked to the fulfilment of technical screening criteria, DNSH requirements, and minimum safeguards. Instead, the analysis is based on a qualitative content analysis of publicly available sustainability documents to determine the extent and quality of their coverage of the environmental objectives and activities defined in the Taxonomy.

Sustainability reporting research and practices in V4 countries

Before the Non-Financial Reporting Directive (NFRD) and the Corporate Sustainability Reporting Directive (CSRD) were introduced, the environmental, social, and governance (ESG) concept was well known and widely applied internationally, alongside related corporate social responsibility (CSR) initiatives. Many companies had prepared CSR reports for competitive reasons, emphasising their economic and social activities and measurements even before the introduction of the NFRD requirement. Thus, there has been continuous development in companies' sustainability reporting practices and in scientific analyses from academic perspectives.

In the V4 region, the most prominent comparative research on ESG and CSR topics has been published by Hąbek and her co-authors. Hąbek and Wolniak (2015) analysed factors influencing the development of CSR reporting practices in the European Union from the perspectives of different stakeholders. The authors showed that greater government participation is needed in developing sustainability reporting practices. Wolniak and Hąbek (2015) identified certain forms of misguided or unsubstantiated environmental claims – what they term "greenwash noise" – that often arise unintentionally from weak regulatory guidance rather than deliberate deception. Building on this, Hąbek and Brodny (2017) highlighted the importance of CSR reporting for effective and clear communication with stakeholders.

In addition to these foundational studies, Balogh *et al.* (2022) investigated factors influencing ESG disclosures among large companies in the Czech Republic. The study developed an ESG disclosure index and analysed data from the 100 largest Czech companies to examine how firm-level factors, such as revenue, employee size, and profitability, affect ESG reporting. Pražáková and Vejsadová Dryjová (2024) meanwhile examined the ESG reporting practices of large Czech companies. They found that the quality and content of ESG reports vary significantly, and the lack of standardisation and comparability represents a major challenge. They also found that non-financial reports are currently produced primarily by companies targeting Western markets, where customers and investors demand ESG values, and even firms not yet legally required to report are doing so voluntarily.

However, despite its critical role in sustainability, the agri-food sector still lags in adopting comprehensive reporting practices. Studies by Lippai-Makra and Kovács (2021) and Boros *et al.* (2022) highlight the challenges and opportunities in aligning the agri-food sector with EU sustainability standards. Kozma and Bosnyák-Simon (2022) examined the sustainability reporting practices of companies in the food, tobacco, and agriculture sectors in Hungary. They found that companies can be classified into three typical groups based on their sustainability documentation: those that produce sustainability reports, those that publish an annual energy report, and those that publish environmental information on their websites or in brochures.

Boros *et al.* (2022) examined 16 Hungarian and 27 international sustainability reports to determine the characteristics of ESG reports, whether they reflect the sustainability activities of individual market actors, and the most pressing issues. Their research found that several co-existing mandatory and voluntary disclosure regimes require different types of information and are therefore only partially suitable for comparing companies' sustainability performance. Gombkötő *et al.* (2023) analysed the sustainability reporting practices of agricultural and forestry companies for 2021. Twenty-six enterprises were surveyed, and only one forestry company had a detailed sustainability report. In addition to voluntary reports, information on sustainability efforts was also presented through ISO standards, good manufacturing and hygiene practices, and quality policy objectives.

This research was based on the study by Lámfalusi *et al.* (2024), in which 52 sustainability documents from large Hungarian food-processing companies were assessed from an EU Taxonomy perspective through content analysis using a scoring method for the 2020–2021 financial period. The results showed that the sustainability reporting practices of the selected large corporations in Hungary dif-

fered significantly. Still, the disclosure of information and data was most relevant for Taxonomy objectives related to climate change mitigation, sustainable water use, and the transition to a circular economy. As a continuation of the study, the publication of sustainability documents was analysed by food industry subsector (Gombkötő *et al.,* 2025). According to the analysis, the content and quality of sustainability reporting by food companies vary across subsectors. Based on an analysis of ESG indices, Horváth *et al.* (2025) report that Hungarian agricultural and food industry firms exhibit an aggregated ESG score of 4.76, approximately 2.4 points below the national corporate average. The imbalance among the ESG pillars is evident: while social and governance dimensions reflect relatively stable performance, the environmental pillar remains significantly underdeveloped. The findings further indicate a strong positive correlation between ESG performance and firm size, with larger enterprises achieving notably higher scores. Moreover, export-oriented firms tend to outperform their domestic counterparts in overall ESG metrics; however, substantial improvements in environmental performance are observed exclusively among companies with a strong focus on foreign markets. Zanocz (2025) conducted an exploratory qualitative study on sustainability reporting practices in the Hungarian agricultural sector, revealing that most companies view sustainability reporting primarily as a compliance requirement rather than a strategic tool, with significant variation in reporting depth and stakeholder engagement approaches.

In Poland, the introduction of mandatory NFRD requirements for a defined set of large firms significantly influenced the development of ESG reporting practices. These requirements contributed to an increase in the amount of ESG information companies published. The emergence of new and expanded regulatory obligations further strengthened companies' reporting practices. Although the quality of ESG information reported by Polish companies is improving, its consistency, comparability, and reliability still vary. Sienkiewicz *et al.* (2023) emphasised that the financial market plays a vital role in developing offerings that support environmentally friendly and socially responsible investments and projects. This market is itself subject to ESG-related regulations while serving as a leader in change. Polish companies are increasingly facing more stringent ESG requirements from both international business partners and financial institutions.

Badowski *et al.* (2022), in a PwC report on ESG in consumer goods and retail, emphasise that this sector is particularly susceptible to sustainability issues. While 76% of surveyed companies are preparing to report in line with the latest European Sustainability Reporting Standards (ESRS), the pace of change should be more substantial. Moreover, Gigol (2024) examined the extent to which top managers of Polish enterprises agree on the importance of environmental and social factors in daily management. The study was conducted among a representative group of company representatives in Poland. The majority of respondents who influence the company believed that responsible management, including CSR, is primarily a public relations strategy.

In the existing Polish literature, issues related to CSR in companies operating within the food supply chain are rarely discussed.

However, as is commonly emphasised, in these companies the adoption of CSR principles is also a crucial element in building their competitive advantage (Gołębiewska *et al.,* 2022). Gołębiewska *et al.* (2022) conducted research among dairy cooperatives. Their study analysed four aspects of CSR and found that companies consider fair market practices and actions for local communities to be the two most important. It also showed that the CSR approach was not influenced by company size, measured by product sales value, as both smaller and larger companies exhibited the same elements of CSR. Siemiński (2023) researched managers' perceptions of CSR in small and medium-sized enterprises in the food industry. The author concluded that, according to the surveyed managers, the importance of socially responsible values is higher than the average value assigned by the SME sector. The respondents highlighted the important role of ethical standards in the processes carried out in their companies. However, most of the activities in this area are not systematised, formalised, or expressed in internal codes of ethical conduct.

Kozáková *et al.* (2023) described selected aspects of CSR in the business practices of companies from three Visegrad countries (the Czech Republic, Poland, and Slovakia) and compared the results across these countries. The study used various groups of variables related to general characteristics, CSR characteristics, Triple Bottom Line activities, CSR reporting, and CSR activities connected with global crises.

Methodology

This section presents the sample selection by country, followed by the scoring method used in the research. The analysis was carried out among large food-processing companies operating in the Visegrád Four (V4) countries. Companies were selected based on corporate tax filings and classified by subsector according to NACE codes. Because data collection took place from 2023 to early 2025 – before most companies had published their 2023 or 2024 reports – the analysis relied on financial and sustainability reporting data for the years 2021–2022. The analysis encompassed the C10 – Manufacture of food products division (including groups C10.1–C10.9), the C11 – Manufacture of beverages division (group C11.0), and the C12 – Manufacture of tobacco products division (group C12.0).

In line with Article 3 of Directive 2013/34/EU, large companies were selected in each country if they met at least two of the following criteria in the last two financial years: (1) total assets exceeding EUR 20 million, (2) annual net revenue over EUR 40 million, or (3) an average of at least 250 employees during the financial year. Although the samples accounted for less than 2.0% of the total number of companies in each of the V4 countries, they represented more than 50.0% of the leading financial indicators in all cases, indicating the high financial concentration of the V4 food-processing industries (Table 1).

Table 1: Main characteristics of the samples in relation to the whole sector in V4 countries in 2022.

Designation	Czech Republic	Hungary	Poland	Slovakia
Number of companies in the samples	69	86	337*	32
Number of companies in the whole sector	13,039	7,123	19,198	6,015
Shares of the samples to the whole sector:				
Number of companies	0.5%	1.2%	1.8%	0.5%
Net revenue	68%	67%	77%	48%
Net profit	71%	62%	65%	71%
Total asset	73%	62%	78%	52%
Equity	76%	53%	81%	60%

*Note: within this, the number of companies with more than 500 employees is 107.
Source: Authors' own calculation based on the database from ceginformacio.hu and Eurostat (2025) database

Sustainability samples

In the next phase, sustainability samples were identified country by country. For this purpose, we selected from the samples those companies that had publicly available sustainability documents on their websites. The documents were classified into the following types:

- detailed sustainability reports (relatively long documents following international standards: GRI, TCFD, SASB);
- simplified sustainability reports (shorter, concise sustainability reports, generally including figures);
- other environmental documents (one or more short documents covering only specific environmental or sustainability topics, e.g., energy or waste management);
- websites with figures (websites providing more or less detailed descriptions and data on sustainability topics).

Standard documents such as ISO certificates and/or energy expert reports were not taken into account. In countries where the sector is relatively small (the Czech Republic, Hungary, and Slovakia), and therefore the number of companies was manageable, we conducted a comprehensive survey. To ensure the feasibility of the research, a restriction was necessary when selecting the Polish sustainability sample. Due to the large size of the Polish food-processing sector and consequently the sample (337 firms), the research in Poland focused on the most decisive companies with more than 500 employees (107 firms; Table 1). This adjustment may affect the results for the Polish sample, as large companies with more than 500 employees are well capitalised, thus can allocate more resources to sustainability and reporting (including data collection and measurement), resulting in better sustainability performance and higher quality reporting.

For multinational companies with subsidiaries in one or more V4 countries, we analysed the parent company's sustainability reports for all subsidiaries. For these parent companies, the designation "Global" was used in the research. Approximately half of the "Global" companies were listed

Table 2: Distribution of "Global" corporations in the V4 region in 2022.

Characterisation of "Global" companies	Total size	Czech Republic	Hungary	Poland	Slovakia
Number of "Global" companies	50	17	25	14	9
Number of listed companies	22	7	11	8	6
Number of non-listed companies	28	10	14	6	3

Note: 2 "Globals" (both listed) are common to 3 of the V4 countries; 11 "Globals" (6 listed, five non-listed) are common to 2 of the V4 countries.
Source: Own compilation of the authors

corporations and were therefore mandated to report under the NFRD. We analysed 50 "Global" companies; within this group, the subsidiaries of 13 companies were present in more than one country. Compared to the total sample, the proportions of global companies were 25% in the Czech Republic, 29% in Hungary, 13% in Poland (relative to 107 companies), and 28% in Slovakia. Of the 50 "Global" corporations, 22 were listed on stock exchanges and were therefore required to prepare sustainability reports, while the remaining 28 were non-listed firms; thus, their reporting was voluntary during the reviewed period (Table 2).

Relative scoring method

To perform the content analysis, we used a scoring method developed by Lámfalusi *et al.* (2024), based on the work of Hąbek and Wolniak (2016) and Hoffmann *et al.* (2018), and adapted it to the V4 sample. The information on the EU Taxonomy contained in individual companies' sustainability reports was identified in line with the six environmental objectives set out in Regulation (EU) 2020/852 and the corresponding environmentally sustainable economic activities (EP, 2020).

In addition, the first objective, climate change mitigation, has a total of eight related economic activities, indicated by letters (a–h) in the Regulation; we added one additional activity to the list – "greenhouse gas emissions (GHG)" – because it appeared in most sustainability reports with a specific, separate numerical value. The same minor supplementation was applied to Objective 4, transition to a circular economy, which has eleven related economic activities, indicated by letters (a–k). We supplemented the list with "circular economy (CE)" because some sustainability reports referred to it by name without detailing the specific activities (Table 3).

Consequently, there were 6 Taxonomy objectives and 35 Taxonomy activities (i.e., 2 + 33). In the sustainability documents, we examined the occurrence of sustainable activities and the quality of the information presented. The quality of the information was rated on a scale of 0 to 3, following the Hungarian pre-research, which used the standard four-point IÖW scale (Lautermann *et al*. 2021) and the parameters for environmental responsibility (pp. 103, 110; Table 4). Table 5 presents some examples of sustainability performance assessments.

Table 3: The environmental objectives of the Taxonomy and related activities.

Objectives	List of activities
1. Climate change mitigation (1+8 activities)	Greenhouse gas emission (GHG) a. generating, transmitting, storing, distributing, or using renewable energy, b. improving energy efficiency, c. increasing clean or climate-neutral mobility, d. switching to the use of sustainably sourced renewable materials, e. increasing the use of environmentally safe carbon capture and utilisation (CCU) and carbon capture and storage (CCS) technologies, f. strengthening land carbon sinks, g. establishing energy infrastructure required for enabling the decarbonisation of energy systems, h. producing clean and efficient fuels.
2. Climate change adaptation (2 activities)	a. includes adaptation solutions that either substantially reduce the risk of the adverse impact of the current climate and the expected future climate on that economic activity or substantially reduce that adverse impact, without increasing the risk of an adverse impact on people, nature, or assets, b. provides adaptation solutions that contribute substantially to preventing or reducing the risk of the adverse impact of the current climate and the expected future climate on people, nature, or assets, without increasing the risk of an adverse impact on other people, nature, or assets.
3. Sustainable use and protection of water and marine resources (4 activities)	a. protecting the environment from the adverse effects of urban and industrial b. waste-water discharges c. protecting human health from the adverse impact of any contamination of water intended for human consumption, d. improving water management and efficiency, e. ensuring the sustainable use of marine ecosystem services.
4. Transition to a circular economy (1+11 activities)	Circular economy (CE) a. uses natural resources, reducing the use of primary raw materials, increasing the use of by-products and secondary raw materials, or resource and energy efficiency measures, b. increases the durability, repairability, upgradability, or reusability of products, c. increases the recyclability of products, d. substantially reduces the content of hazardous substances, e. prolongs the use of products, f. increases the use of secondary raw materials and their quality, g. prevents or reduces waste generation, h. increases the preparation for the re-use and recycling of waste, i. increases the development of the waste management infrastructure, j. minimises the incineration of waste and avoids the disposal of waste, k. avoids and reduces litter.
5. Pollution prevention and control (4 activities)	a. preventing or reducing pollutant emissions, other than greenhouse gases, b. improving levels of air, water, or soil quality in the areas of the economic activity, c. preventing or minimising any adverse impact on human health and the environment of the production, use or disposal of chemicals, d. cleaning up litter and other pollution.
6. Protection and restoration of biodiversity and ecosystems (4 activities)	a. nature and biodiversity conservation, b. sustainable land use and management, c. sustainable agricultural practices, d. sustainable forest management.

Source: Own compilation of the authors based on Taxonomy Regulation (EU) 2020/852 (EP, 2020)

Table 4: Four-point scale for assessing the quality of information on sustainable activities.

Scores	Explanation
0	no information
1	only textual information
2	simple numerical value (numerical value for a given year without comparison)
3	numerical values expressing progress (base, comparisons, targets in line with Article 1 of the CSRD)

Source: Own compilation of the authors

Table 5: Examples for assessing the quality of information on sustainable activities.

Information from sustainability reports	Activity	Scores
1. Climate change mitigation		
By year-end 2023, we sourced 91.9% renewable electricity in our manufacturing sites compared with 78.4% in 2022.	a) generating, transmitting, storing, distributing, or using renewable energy,	3
Installation of electric chargers on the different locations.	g) establishing energy infrastructure required for enabling the decarbonisation of energy systems	1
3. Sustainable use and protection of water and marine resources		
Improvement of water management practices including waste water treatment.	a) protecting the environment from the adverse effects of urban and industrial wastewater discharges	1
4. Transition to a circular economy		
By the end of 2023, 83.5% of the plastic packaging was designed for recycling. By 2025, the company aims to design above 95% of plastic packaging for recycling and continue to work toward 100% being recyclable or reusable.	f) increases the use of secondary raw materials and their quality	3
The main element in waste management guidelines is to reduce the quantity of the generated waste. The amount of waste per bottle is 0.19 kg.	g) prevents or reduces waste generation	2
6. Protection and restoration of biodiversity and ecosystems		
Implement regenerative agriculture practices on 1 million hectares of agricultural land by 2030.	c) sustainable agricultural practices	2

Source: Own compilation of the authors, based on the examined sustainability reports

Table 6: Maximum absolute scores per company and country's sustainability sample for EU Taxonomy objectives.

Objective	Number of activities	Maximum scores per company	Maximum scores per country's sustainability sample
1. Climate change mitigation	1+8	27	$27 \cdot C_v$
2. Climate change adaptation	2	6	$6 \cdot C_v$
3. The sustainable use and protection of water and marine resources	4	12	$12 \cdot C_v$
4. The transition to a circular economy	1+11	36	$36 \cdot C_v$
5. Pollution prevention and control	4	12	$12 \cdot C_v$
6. The protection and restoration of biodiversity and ecosystems	4	12	$12 \cdot C_v$
Total	35	105	$105 \cdot C_v$

Note: CV denotes the number of selected large companies in the sustainability samples of the V4 countries: in the Czech Republic, CC = 21; in Hungary, CH = 46; in Poland, CP = 31; in Slovakia, CS = 12, as detailed in Table 2.
Source: Own compilation of the authors

If a report contained information of varying quality related to a Taxonomy activity and resulted in multiple scores, the highest-scoring information was used for the assessment. The maximum number of points that could be assigned to a Taxonomy activity was 3. Thus, the points assigned to each objective ranged from 6 (Objective 2: climate change adaptation) to 36 (Objective 4: transition to a circular economy), depending on the number of activities within that objective. If a company report had included the highest level of information for every Taxonomy activity, it would have scored 105 points. Table 6 presents the number of companies in each V4 country's sustainability sample (indicated by C_v) (Table 6).

Relative scores used in the comparisons (which all fell within the 0-1 range) are presented as multiples of 100 for clarity.

P_t: Relative score of the t. Taxonomy objective:

$$P_t = \left(\sum_{i=1}^{C_v} \sum_{j=1}^{n_t} x_{ij}\right) * 100/(n_t * 3 * C_v) \quad (1)$$

$t \in \{1, \dots, 6\}$

n_t: Number of activities within the *t*. Taxonomy objective, $\sum_{t=1}^{6} n_t = 35$.

x_{ij}: Activity score per company within the *t*. Taxonomy objective, $x_{ij} \in \{0,1,2,3\}$.

$i = 1, \dots, \boldsymbol{C_v}$: Index of the number of selected companies with online sustainability reports per country.

$\boldsymbol{C_v} \in \{21,46,31,12\}$: number of large companies with online sustainability reports in the country's sample in alphabetical order of the V4 countries (Czech Republic, Hungary, Poland, Slovakia).

$j = 1, \dots, n_t$: Index of the number of activities within the *t*. Taxonomy objective.

Relative scores were calculated both for individual companies within the sustainability samples and for each sustainability sample as a whole. The most significant advantage of the relative scoring method is that it eliminates the influence of sample size, so comparisons are not affected by the number of corporations in the sample.

Table 7: Main characteristics of sustainability samples in V4 food-processing industries.

V4 countries / Investigated parameters	Czech Republic	Hungary	Poland	Slovakia
The selected samples	69	86	107*	32
Sustainability samples	21	46	31	12
Types of online sustainability documents				
Detailed sustainability report	16	25	13	9
out of this "Global Companies" report	14	20	11	7
Simplified sustainability report	3	5	11	1
out of this "Global Companies" report	3	3	3	0
Other document	1	13	3	2
out of this "Global Companies" report	0	2	0	2
Website with figures	1	3	4	0

*Note: In the Polish case, the sustainability sample was selected from the group of those 107 corporates that had more than 500 employees.
Source: Own compilation of the authors

In order to eliminate subjectivity in scoring, we used a two-round verification process. In the first round, the authors checked each other's scores within the working groups of each country, and in the second round, the project coordinator team checked the scores of the working groups of the countries.

In the next section, the research results are presented in aggregate form for the different sustainability samples.

Results

As a first step, the prevalence and types of sustainability documents across countries are presented. It is important to note that we reviewed sustainability documents covering the period 2021–2023, using the most recent available document for content analysis. It should be emphasised that during the research period, the Non-Financial Reporting Directive (NFRD) was still in force; however, the Corporate Sustainability Reporting Directive (CSRD) requirements and the EU Taxonomy were already more or less known to companies, so the NFRD–CSRD transition process had presumably begun.

The distribution of sustainability documents available online shows that the Hungarian sustainability sample had the highest proportion (53.5%). In comparison, the figure in the other countries was approximately one-third (Czech Republic: 30.4%, Slovakia: 37.5%, Poland: 29% – in the case of Poland, the ratio was calculated relative to the 107 companies with more than 500 employees; Table 6). Among the sustainability documents, detailed sustainability reports constituted the highest proportion in all countries: in Slovakia and the Czech Republic, they constituted the overwhelming majority (79.5% and 71.4%, respectively), while in Hungary and Poland, the proportion of detailed reports was 54.3% and 41.9%, respectively. In Poland, simplified sustainability reports were also widespread (35.5%), and in Hungary, other sustainability documents were also relevant (28.3%; Table 7).

At least 80% of the detailed sustainability reports in all V4 countries were produced by "Global" companies, indicating that these corporations are at the forefront of sustainability reporting. This is also explained by the fact that 44% of the global companies in the sample were obliged to report during the period under review.

When comparing the quality of the different types of sustainability documents, Figure 1 shows that the detailed sustainability report represented the highest quality in all countries, followed by the simplified sustainability report. A detailed website with figures received lower scores in each country (not included in the sample for Slovakia), while

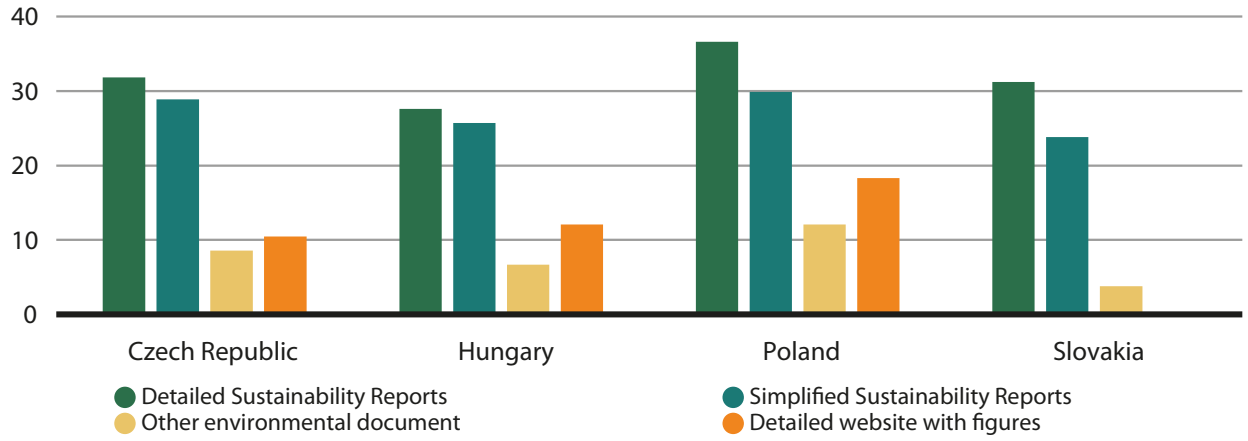

Figure 1: Relative scores of different types of sustainability documents by countries.
Source: Own composition of the authors

other environmental documents represented the lowest quality in all countries. Country-level differences in scores showed that Hungary had the lowest scores across document categories, while Poland had the highest. In the latter case, the composition of the Polish sample (companies with over 500 employees) is most likely to had an influence. Annex 1 shows the scores for each document type broken down by Taxonomy objectives.

Subsequently, we analysed which subsectors were more inclined to disclose sustainability information and assessed potential cross-country differences in this regard (Table 8).

The disclosure practices of sustainability documents varied across countries when examined by subsector. In the Czech Republic, of the 10 relevant subsectors, only four had published sustainability documents. Among these, companies in the production of oils and fats, other food manufacturing, and tobacco manufacturing subsectors had publication rates exceeding 50%. In Hungary, sustainability documents were present in all relevant subsectors, and in seven of them, they represented more than half of the sample. In Poland, sustainability documents were issued in 10 of the 11 subsectors. Among these, the production of oils and fats, animal feed manufacturing, and beverage production subsectors had publication rates above 50%. In Slovakia, out of eight relevant subsectors, two had publication rates exceeding 50% (oil production and other food manufacturing), whereas in two subsectors, no sustainability documents were published. (Table 8).

Table 8: Percentage of companies disclosing sustainability documents in each sub-sector sample.

Subsectors	Czech Republic (%)	Hungary (%)	Poland (%)	Slovakia (%)
Proc. and pres. of meat and the production of meat products	0.0	22.2	28.6	33.3
Proc. and pres. of fish, crustaceans, and molluscs	–	–	20.0	–
Proc. and pres. of fruit and vegetables	0.0	50.0	0.0	0.0
Manufacture of vegetable and animal oils and fats	100.0	75.0	100.0	50.0
Manufacture of dairy products	0.0	40.0	22.2	40.0
Manufacture of grain mill products, starches, and starch products	0.0	55.6	33.3	33.3
Manufacture of bakery and farinaceous products	0.0	66.7	28.6	0.0
Manufacture of other food products	70.6	80.0	35.0	66.7
Manufacture of prepared animal feeds	0.0	54.5	50.0	–
Manufacture of beverages	38.5	88.9	50.0	37.5
Manufacture of tobacco products	100.0	33.3	20.0	–

Note: Percentages were calculated as follows: number of companies in the sustainability sample/number of companies in the financial sample, except in the Polish case, where, instead of 337 companies in the financial sample, the calculation was based on the aforementioned 107 companies with more than 500 employees. The subsector is not included in the sample: -
Source: Own composition of the authors

Based on the results, it is worth highlighting that one-third to one-half of the V4 countries' large companies had already published sustainability documents, mostly detailed or simplified sustainability reports, even before mandatory reporting came into effect. There were differences between countries in the food industry sub-sectors, but sustainability reports were consistently present in the oil and fat production, the manufacture of other food products, and beverage production sectors in all countries. Among these, the manufacture of vegetable and animal oils and fats had the highest proportion of sustainability reports. This may be attributed either to greater environmental exposure resulting from the sub-sectors' close interconnections with agriculture and natural resources and/or to the substantial presence of multinational corporations within the sub-sectors.

The primary goal of our research was to conduct a content analysis of sustainability documents from large companies in the V4 region, in line with the objectives and activities defined by the EU Taxonomy. For this content analysis, the relative scoring method presented in the methodology section was applied.

As shown in Figure 2, the climate change mitigation objective received the highest relative score, indicating that large food companies in the region have taken the most steps to achieve this goal, based on their sustainability reports. This is followed by protecting and restoring biodiversity and sustainable water use, with nearly equal scores, and transitioning to a circular economy, with a slightly lower rating.

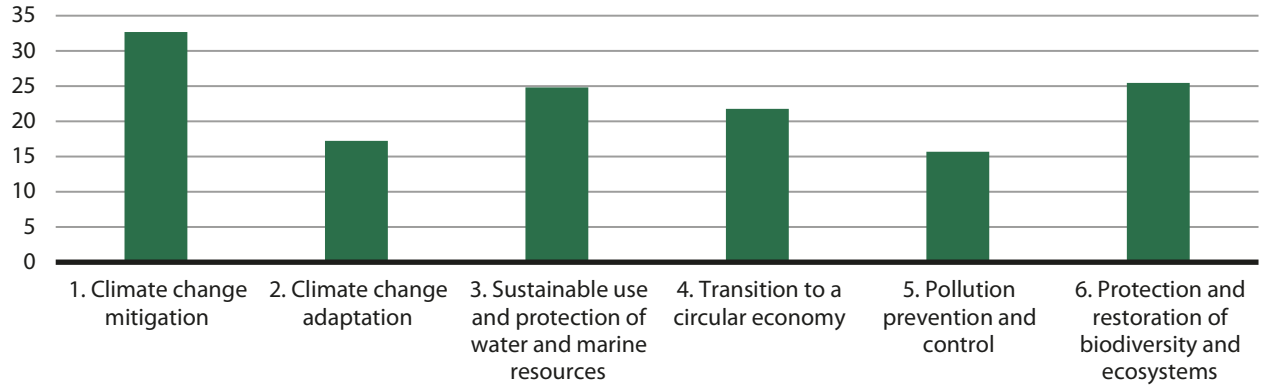

Figure 2: Relative scores of Taxonomy objectives in the V4 region's sustainability samples.
Source: Own composition of the authors

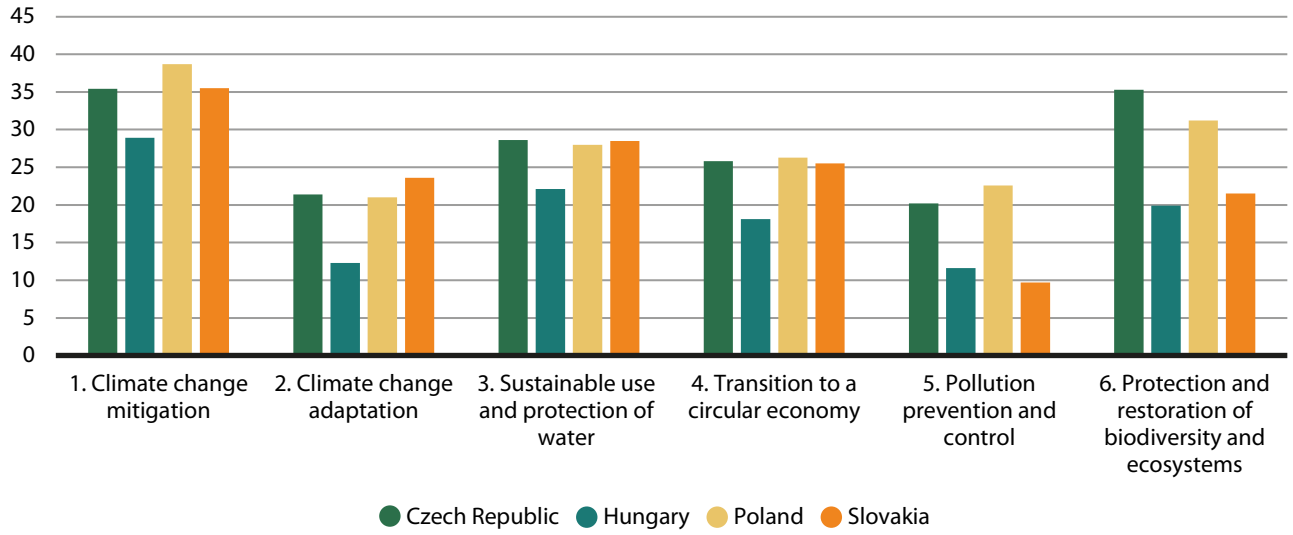

Figure 3: Relative scores of Taxonomy objectives in V4 countries' sustainability samples.

Source: Own composition of the authors

Climate change adaptation and pollution prevention and control seem to be less relevant objectives for food-processing companies in the region.

Examining the results by country, it can be seen that climate change mitigation received the highest score in each country. The scores for the other Taxonomy objectives were more diverse across countries. In the Czech Republic and Poland, protection and restoration of biodiversity received the second-highest relative score. In contrast, this objective was ranked lower in the Slovak and Hungarian samples, although it was only slightly behind in the Hungarian sample, coming in third place. For Hungarian and Slovak companies, the sustainable use and protection of water and marine resources received the second-highest score, and this objective also achieved the third-highest score in the Czech Republic and Poland. Scores of transition to circular economy were only slightly below those for the sustainable use of water resources across all four countries. Climate change adaptation and pollution prevention and control objectives received the lowest scores in each country (Figure 3).

In the following, we present the sustainable activities related to the Taxonomy objectives that received the highest scores for each objective (Table 9).

For most Taxonomy objectives, companies in each country achieved the highest scores for the same sustainable activities, many of which were aimed at more efficient use of resources. This clearly reflects a sector-specific characteristic that food-processing is highly energy and water-intensive, and implies that the countries share similar macro-environmental conditions.

In all four countries, the highest scores were achieved for activities related to reducing greenhouse gas (GHG) emissions and using renewable energy under the climate change mitigation objective. In Hungary, the activity aimed at improving energy efficiency also received high scores, whereas in the other countries, the scores for this activity were not far below 50. The high GHG emissions scores are likely due to the EU and national climate protection regulations, as well as CSRD, which require companies to achieve related targets and disclose them along with the steps taken to achieve them, at least for 2030 and 2050. The high scores for activities related to renewable energy and energy efficiency may reflect the fact that, in recent years, the energy sector and energy market prices have been characterised by uncertainty, motivating companies to diversify and increase the efficiency of their energy use.

For the Taxonomy objective of sustainable use and protection of water and marine resources, improving water management and efficiency achieved the highest score in all four countries and with regard to the objective of transition to a circular economy, the efficient use of natural resources and the use of secondary raw materials in production also received the highest score across all four countries.

For the Taxonomy objective of protecting and restoring biodiversity and ecosystems, sustainable agricultural practices received the highest score in three countries and ranked second in the Czech Republic. Food companies can influence this objective and activity mostly indirectly, through their suppliers (Scope 3). Companies achieve this influence through various coordination mechanisms, such as incorporating sustainability criteria in supplier contracts, supplier guidelines, or by sharing sustainable practices and technologies within the framework of farmer-processor integration.

For the climate change adaptation objective, three countries scored highest for adaptation solutions that reduce the risk of adverse climate change impacts. In contrast, for the pollution prevention and control objective, the highest-scoring activities showed a more varied picture across countries.

With the adoption of the Omnibus package (EC, 2025), the reporting obligation for many companies has been post-

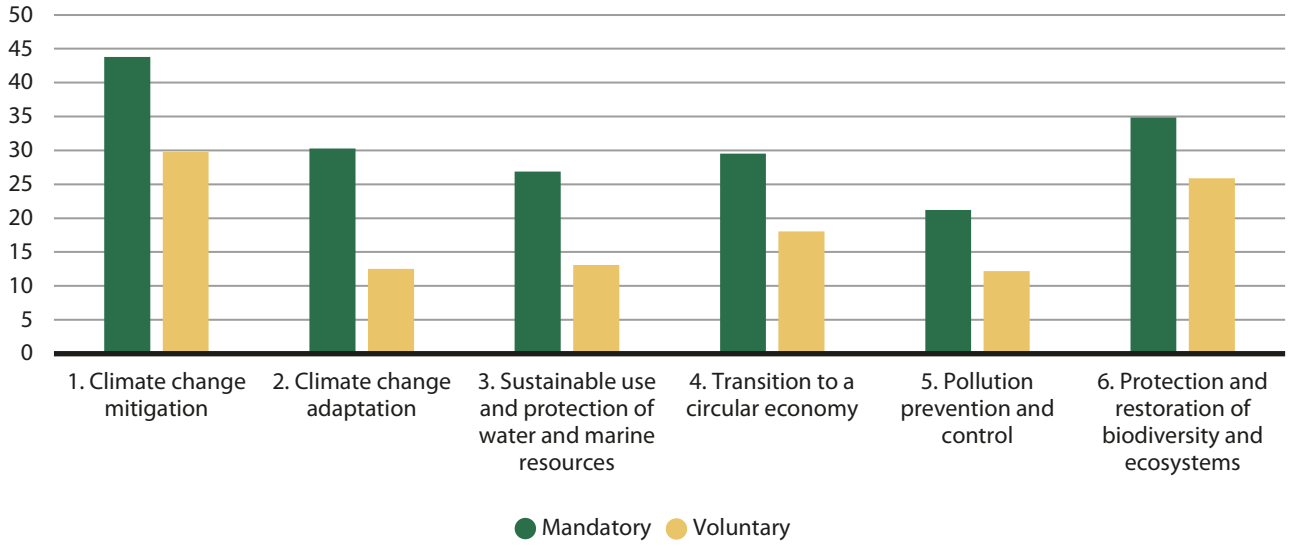

Figure 4: Relative scores for mandatory and voluntary sustainability reports of global companies for Taxonomy objectives.

Number of mandatory reports=22, Number of voluntary reports=28.
Source: Own composition of the authors

poned by up to two years, and the scope of entities required to report has been significantly narrowed. However, companies retain the option to report voluntarily. This raises the question of whether mandatory requirements affect the quality of sustainability reports. We examined this issue using the global companies, which are assumed to have similar capabilities and resources for preparing sustainability reports.

When examining the scores achieved by the global companies, the highest score was for climate change mitigation (35.9), followed by protection and restoration of biodiversity and ecosystems (29.8). Third was transition to a circular economy (23.1), followed by climate change adaptation and sustainable use and protection of water and marine resources, which had close scores (20.3 and 19.2, respectively). Pollution prevention and control achieved a somewhat lower score (16.2).

Figure 4 shows the differences in the quality of information disclosed in mandatory versus voluntary sustainability reports for these global companies. Mandatory reports achieved higher scores for all Taxonomy objectives than voluntary reports did. This clearly demonstrates the impact of mandatory regulation on both the quality of sustainability reports and the use of quantitative data to support disclosed information.

As key findings, it can be said that there were large companies in the V4 countries that have made efforts to communicate their sustainability activities through a sustainability document, even without legal obligations. Their sustainability measures were primarily aimed at mitigating climate change through GHG reduction, and the more efficient and environmentally friendly use of resources has also come to the fore. However, the expected easing of legal obligations is likely to slow down the spread of sustainability documentation and improvements in its quality.

Discussion

The study assessed the sustainability reporting practices of large food-processing companies in the Visegrád Four (V4) countries – the Czech Republic, Hungary, Poland, and Slovakia – as viewed through the lens of the EU Taxonomy objectives. The analysis covered publicly available sustainability documents published between 2021 and 2023, during the transition from the Non-Financial Reporting Directive (NFRD) to the Corporate Sustainability Reporting Directive (CSRD) requirements. The group of large companies examined was identified in accordance with the criteria set out in the CSRD. According to these criteria, they accounted for less than 2.0% of all companies in each country's sample. However, in all cases, they represented more than 50.0% of the leading financial indicators, indicating the segment's market dominance and the high financial concentration of the food-processing industries in the V4 countries.

Even though only a small proportion of large companies were obliged to prepare sustainability reports during the period under review, in the Czech Republic, Slovakia, and Poland, approximately one-third of the large companies surveyed published some form of sustainability document, whereas in Hungary, the ratio reached 54%. Detailed sustainability reports dominated across all countries, particularly in Slovakia (79.5%) and the Czech Republic (71.4%). Hungary and Poland showed greater diversity, with simplified reports and other sustainability documents also present. Notably, over 80% of detailed reports originated from global corporations, reflecting their leadership in sustainability reporting.

Relative scoring revealed that climate change mitigation consistently ranked highest across all countries, driven by activities such as reducing greenhouse gas (GHG) emissions, adopting renewable energy, and improving energy efficiency. The high relevance of climate change mitigation is likely due to EU and national climate protection regulations, the GHG reduction targets set for 2030 and 2050, and also the high

energy prices in the last couple of years. The finding that these objectives and activities have key importance is consistent with the results of our previous study conducted in Hungary (Lámfalusi *et al.,* 2024). As the food industry is a water-intensive sector, the protection of water and marine resources also received a high score in the region. This was followed by the transition to a circular economy, for which the food industry can take relevant steps, such as using by-products, recycled or bio-based packaging, etc. Protection and restoration of biodiversity and ecosystems ranked second in the Czech Republic and Poland, but lower in Hungary and Slovakia. It is worth mentioning that this objective also received the second-highest score among global companies. This suggests that this objective tends to be more relevant for firms, and more prevalent in countries where food value chains are vertically coordinated, as processing companies can exert greater influence over Scope 3 impacts – for example, by promoting sustainable agricultural practices. Adaptation to climate change and pollution prevention and control objectives received the lowest scores in the region. Companies should pay more attention to these in the future, both in terms of environmental performance and its quantification and transparency, although it is worth noting that adaptation to climate change is more relevant in agricultural production.

Mandatory reports consistently achieved higher scores across all Taxonomy objectives than voluntary reports, demonstrating the significant influence of regulatory requirements on disclosure quality. The adoption of the Omnibus Package significantly reduces the scope of organizations subject to mandatory reporting requirements, which may hinder the spread of reporting and improvements in quality. However, at the time of our analysis, a higher proportion of firms published sustainability documents than were required, which suggests that factors beyond regulatory obligations also drive sustainability initiatives and reporting. These factors certainly include gradual preparation for upcoming mandatory requirements as well as an increasing commitment to meeting sustainability expectations and enhancing transparency.

Based on the assessment of sustainable activities, large food-industry companies in the V4 countries primarily aimed to improve resource efficiency in production. This goal serves not only environmental sustainability but also economic and competitiveness objectives, which – in the context of the global crises affecting Europe and the uncertainties and rising prices in the energy market since 2021 – are essential for achieving environmental targets, ensuring food security, and maintaining the EU's global leadership in food trade (Haniotis, 2025). Therefore, despite the Omnibus package easing disclosure requirements, progress toward environmental sustainability is likely to continue – albeit at a slower pace – in the region, particularly in sectors highly exposed to energy and climate risks, such as the food industry. Furthermore, although consumers in the region remain price-sensitive, and this trend has not been alleviated by the recent food price increases (Matthews, 2023), environmental awareness is expected to increase in the future, and international retail chains are imposing stricter environmental requirements on their suppliers in this region as well. Consequently, transparent documentation and communication of environmental sustainability efforts will remain key to maintaining long-term competitiveness.

One limitation of our research is that the review of the sustainability documents was conducted by our research team, relying on a basic, simple cross-check of each other's work. This procedure could be significantly improved by involving ESG experts from the studied companies, for example, through in-depth interviews. Another limitation is that, due to the large sample size in Poland, the analysis was restricted to companies with more than 500 employees, something which diverges from the initial sampling concept and may also bias the results for the Polish food-processing sector. Therefore, future research may benefit from including Polish companies with fewer than 500 employees or from applying a different sampling method, such as quota sampling. It may also be useful to compare the sustainability reports of companies with more than 500 employees across countries; however, this would create an imbalance in favour of Poland, as the three smaller countries have only a limited number of companies exceeding this employee threshold.

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Appendix

Table A1: Relative scores of different types of sustainability reports by countries and activities

Type of reports	Taxonomy objectives	Czech Republic	Hungary	Poland	Slovakia
Detailed Sustainability Reports	1. Climate change mitigation	40.5	38.1	45.6	40.7
	2. Climate change adaptation	25.0	16.7	34.6	31.5
	3. Sustainable use and protection of water and marine resources	32.3	30.3	39.7	35.2
	4. Transition to a circular economy	29.3	25.3	31.8	30.6
	5. Pollution prevention and control	19.8	15.0	24.4	12.0
	6. Protection and restoration of biodiversity and ecosystems	34.9	26.3	41.0	26.9
	Total	31.8	27.6	36.6	31.2
Simplified Sustainability Reports	1. Climate change mitigation	29.6	33.3	43.8	40.7
	2. Climate change adaptation	16.7	20.0	16.7	0.0
	3. Sustainable use and protection of water and marine resources	16.7	20.0	22.7	16.7
	4. Transition to a circular economy	22.2	22.8	27.0	25.0
	5. Pollution prevention and control	36.1	25.0	24.2	8.3
	6. Protection and restoration of biodiversity and ecosystems	58.3	26.7	26.5	16.7
	Total	28.9	25.7	29.9	23.8
Other environmental document	1. Climate change mitigation	7.4	10.3	12.3	9.3
	2. Climate change adaptation	0.0	2.6	0.0	0.0
	3. Sustainable use and protection of water and marine resources	33.3	11.5	16.7	4.2
	4. Transition to a circular economy	5.6	5.6	10.2	2.8
	5. Pollution prevention and control	0.0	1.3	11.1	0.0
	6. Protection and restoration of biodiversity and ecosystems	8.3	4.5	19.4	0.0
	Total	8.6	6.7	12.1	3.8
Detailed website with figures	1. Climate change mitigation	7.4	25.9	22.2	–
	2. Climate change adaptation	16.7	5.6	4.2	–
	3. Sustainable use and protection of water and marine resources	8.3	2.8	12.5	–
	4. Transition to a circular economy	16.7	4.6	18.1	–
	5. Pollution prevention and control	0.0	5.6	20.8	–
	6. Protection and restoration of biodiversity and ecosystems	8.3	22.2	20.8	–
	Total	10.5	12.1	18.3	–

Source: Authors' own calculation