Institute of Agricultural Economics

A GREEN EVALUATION OF THE FOOD INDUSTRIES IN THE V4 COUNTRIES FROM AN EU TAXONOMY PERSPECTIVE

Visegrad Fund

V4 GREEN REPORTING

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Institute of Agricultural Economics (AKI)
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WELCOME INTRODUCTION OF MANAGING DIRECTOR OF AKI

It is my pleasure, as Managing Director of the Institute of Agricultural Economics (AKI), to introduce this book, which represents a significant milestone in our ongoing commitment to advancing sustainability in the food industries of the Visegrad Four (V4) countries. This volume is the culmination of the V4GreenReporting project, a collaborative effort uniting leading research institutions from Hungary, Slovakia, the Czech Republic, and Poland, with the support of the International Visegrad Fund. Our shared objective has been to provide a comprehensive, scientifically rigorous evaluation of sustainability reporting practices in the food, beverages, and tobacco sectors of our region, viewed through the lens of the European Union's Taxonomy and evolving regulatory landscape.

The context for this work is both urgent and complex. The food industry in Central Europe faces mounting pressures: geopolitical instability, volatile energy and input prices, and the imperative to ensure food security while safeguarding environmental and social standards. In response, the European Union has set ambitious green goals, articulated through the Green Deal, the Non-Financial Reporting Directive (NFRD), and most recently, the Corporate Sustainability Reporting Directive (CSRD). These frameworks demand a transition from voluntary to mandatory sustainability reporting, underpinned by the EU Taxonomy's clear, uniform criteria for environmentally sustainable activities.

Our project addresses a critical knowledge gap. Until now, there has been a lack of region-specific, comparative analysis of how large food processing companies in the V4 countries are adapting to these new requirements. By systematically analysing both voluntary and mandatory sustainability reports – using a robust, taxonomy-centered qualitative and quantitative methodology – we have been able to benchmark current practices, highlight best-in-class activities, and identify areas requiring further development. Notably, our research demonstrates that while only a small fraction of companies produce detailed sustainability reports, these firms represent a substantial share of the sector's financial performance, underscoring the importance of their leadership in driving broader change.

The findings presented here are intended to serve a wide range of stakeholders: business leaders, policymakers, financiers, experts, and consumers. By providing transparent, comparative data and analysis, we aim to support more effective decision-making and foster a culture of continuous

improvement in sustainability performance. Our work also offers practical insights for companies preparing to transition from NFRD to CSRD compliance, and for those seeking to align their strategies with the EU's green finance agenda.

This book is not only a record of current achievements but also a foundation for future research and cooperation. The methodology developed here is designed to be repeatable and expandable, providing a template for ongoing monitoring and for extending the analysis to other regions or sectors. As the regulatory environment continues to evolve, and as the demands for transparency and accountability grow, we hope this work will contribute to reducing greenwashing and promoting genuine, measurable progress toward a more sustainable agri-food system.

On behalf of AKI and our partners, I extend my sincere thanks to all contributors, and I commend this book to all who share our commitment to a greener, more resilient future for the V4 region and beyond.

Pál Goda, PhD,
Managing Director
Institute of Agricultural Economics (AKI)

BACKGROUND TO THE RESEARCH

Authors: *Andrea Rózsa, Judit Hámori, Ibolya Lámfalusi, Pál Goda*

In spring 2023, under the leadership of the Institute of Agricultural Economics from Hungary (in Hungarian: 'Agrárközgazdasági Intézet Nonprofit Kft.' (AKI)), we applied for the International Visegrad Fund (IVF) V4 Grant with the title of 'A green evaluation of the food industries in the V4 countries from an EU Taxonomy perspective' (V4GreenReporting) cooperating with the following partner institutions: (1) Széchenyi István University, Albert Kázmér Faculty of Mosonmagyaróvár, Department of Agricultural Economics (SZE) from Hungary, (2) Slovak University of Agriculture in Nitra, Faculty of European Studies and Regional Development, Institute of Regional Studies and Rural Development (SUA) from Slovakia, (3) AMBIS University, Department of Economics and Management (AMBIS) from Czech Republic and (4) European Rural Development Network (ERDN) from Poland.[1]

In August 2023, the IVF decided to award the above partnership a V4 Grant under the ID 22320032.[2]

1 See Annex 1 for more details.
2 https://s3.eu-central-1.amazonaws.com/uploads.mangoweb.org/shared-prod/visegradfund.org/uploads/2023/08/Visegrad-Grants-06-2023.pdf

The theoretical background to the research design was as follows.

In European Union's (EU's) green transition, the cooperation of the V4 countries is very important. Due to the current economic crisis caused by the war and the rise in prices of energy, raw material and agricultural inputs, the role of the food industry has become particularly important in this region. From the standpoint of the political and main stakeholders' (suppliers', producers', financiers' and consumers') decision-making it is increasingly important to take green aspects into account in a way that makes food supply qualitatively safe, healthy and affordable for society based on the use of renewable energy. The cooperation of smaller regions is necessary both to maintain employment and to control quality.

Our gap-filling research has several stages. The AKI-directed Hungarian pre-research – regarding the content analysis of voluntary non-financial reports in terms of EU Taxonomy (Regulation (EU) 2020/852) perspective in food industry based on the Non-financial Reporting Directive (NFRD, Directive 2014/95/EU) regulation still in force in 2022 – has finished in July 2023 and published a paper in the Quality & Quantity international scientific Springer journal in spring 2024 (Lámfalusi *et al.* (2024).[3] Within the framework of the V4 Grant the next phase is the preparation of an extended scientific study (this book) with the involvement of the Czech, Slovak and Polish food industries to analyse similarities and differences. After that, in the future, when Corporate Sustainability Reporting Directive (CSRD, Directive 2022/2464/EU) reports become mandatory, a full V4 analysis will be prepared as a follow-up study. The essence and aim of this follow-up study will be to measure the changes in the content and quality of sustainability reports. We will explore specific modifications made by companies during the process of switching from Non-financial Reporting Directive (NFRD) to Corporate Sustainability Reporting Directive (CSRD), i.e. from voluntary to mandatory reporting.

We expect the research to have a wide-ranging and potentially long-term impact on all the stakeholders (companies, financiers, consumers and political decision-makers) in terms of improving green awareness. The scientific analysis will be based on an excellent, high-level database and well-established, verified qualitative and quantitative methodology derived from the professional literature, supplemented with the scientific ideas of the consortium. An outstanding advantage of the research is that the examination can be repeatable and expandable in the future either in BIOEAST[4] or the whole EU region.

3 Lámfalusi I., Hámori J., Rózsa A., Hegyi J., Kacz K., Miklósné Varga A., Troján, Sz. and Gombkötő N. (2024), "Evaluation of sustainability reporting of the food industry in Hungary from an EU taxonomy perspective", Quality & Quantity, Vol. 58 No. 5, pp.4479-4504, available at: https://doi.org/10.1007/s11135-024-01873-2

4 https://bioeast.eu/

EXECUTIVE SUMMARY

INTRODUCTION

This V4 Grant project led by AKI aims chiefly to provide comprehensive knowledge about the current situation and future opportunities regarding the sustainability objectives and activities of the food, beverages and tobacco industries in the V4 countries from an EU Taxonomy perspective, with a view to promoting environmental-friendly solutions. The research team focused on strengthening macroregional and sectoral cooperation by means of a taxonomy-centred, qualitative and quantitative analysis of voluntary and mandatory sustainability reports of large companies in the food processing industries using a sectoral financial database. We accomplished this unique scientific study in order to provide new, high-quality information for key stakeholders (experts, companies, financiers, consumers, political decision makers) in order to help them realise more effective changes within the green transition process, with a particular focus on switching from NFRD to CSRD.

Our analysis focused on the leading large companies in the food processing industries of the V4 countries. These groups were called financial samples in the research. We investigated the position of these financial samples in relation to the whole industry, country by country as well as within subsectors. The financial concentration of the food processing industries of the V4 countries was the first main assumption of the research.

In the next step, sustainability samples of V4 region were identified country by country. For this purpose – within the financial samples – we selected those companies that had sustainability documents available online.

The core of the comprehensive research was the detailed content analysis of the online sustainability documents of large food processing firms included in the sustainability samples along the objectives and activities of the EU Taxonomy, applying a unique relative scoring method.

As a conclusion of the research, we highlighted the most important taxonomy objectives and activities obtained, based on the relative scoring method in each V4 country, and compared the results, emphasising both similarities and differences.

In this study, we have presented an approach and a methodology that could be the basis for future follow-up research. At the same time, the presented approach and methodology could also be expanded and developed both geographically and methodologically.

At the end of the book, we describe the novelty and limitations of our research and provide some ideas for further development.

MATERIAL AND METHODS

For the research the whole database was purchased from an external data provider ('Céginformáció.hu Kft.'). In accordance with Article 3 of Directive 2013/34/EU, large companies – in the food processing industries (broadly food (NACE C10), beverages (NACE C11) and tobacco (NACE C12) segments) of the V4 countries – were selected if any two of the following three indicators exceeded the following thresholds in the last two financial years: (1) total assets of EUR 20 million, (2) annual net revenue of EUR 40 million, (3) average number of employees in the financial year of 250. At the beginning of the project, the financial reporting data for 2021-2022 were available, so we selected the large firms based on these data. According to the legal criteria and the database financial samples contained 69 corporates in Czech Republic, 86 corporates in Hungary, 337 corporates in Poland and 32 large companies in Slovakia.

In the next step, main financial data (the revenue, net profit, total assets and equity) were collected regarding the whole food processing industries and all the relevant subsectors of V4 region country by country. In order to investigate the potential financial concentration, firstly the shares of the number of selected companies in financial samples relative to the whole industries were analysed and secondly, the shares of main financial data of both the entire industries by country and the selected large company groups by country were calculated and compared.

During the research financial and sustainability samples were differentiated. From the financial samples we selected those firms whose had online available sustainability documents on their websites according to the following types of documents: detailed sustainability reports (with GRI standard), simplified sustainability reports, other (environmental) documents, websites with figures. The research team decided to investigate sustainability documents in 2021-2023 period and the most recent report available online was selected for the assessment. Selection of the Polish sustainability sample exceptionally included a restriction. Due to the large Polish financial sample size (337 firms), the research was focused on corporates with more than 500 employees (107 companies) in Poland. In selecting the Polish sustainability sample, the research team aimed to analyse the most relevant companies from the subsectors that were highly represented in the financial sample. At the same time, it was also important point of view that the Polish sustainability sample should include companies that are also actors of common outstanding subsectors of the V4 countries. Therefore, sustainability samples contained 21 corporates in Czech Republic, 46 corporates in Hungary, 31 corporates in Poland and 12 large companies in Slovakia.

Sustainability samples were investigated along the types of documents and the types of companies. Furthermore, the outstanding subsectors were identified based on the following calculation:

what percentage of companies were represented in the sustainability sample by subsector compared to the original financial sample.

Methodology of the detailed content analysis of sustainability samples along the objectives and activities of the EU Taxonomy and explanation of the unique relative scoring formula are presented in subchapter 3.1. (Applied method). A four-point scale assessment (0-3 points) was applied in the analysis. The aggregate absolute scores per objective was divided by the following multiplication. Denominator consisted of three elements of the multiplication: sustainability sample size, the number of activities within the given objective and the maximum possible score. Thus, the relative scoring formula eliminated the differences in the size of sustainability samples. For the illustration of the applicability a detailed case study is shown in subchapter 3.2.

The research team decided that in cases where the parent company of a subsidiary in a V4 country prepares a sustainability report, this parent company's report will be chosen for the content analysis. These companies were given special attention during the research and were indicated by the name of 'Global'. In a separate chapter, we dealt with in detail the content analysis of sustainability reports regarding so-called 'Global' companies.

Financial concentration and the relative scoring assessments made along the EU taxonomy objectives and activities for sustainability samples were analysed in separate country chapters. Finally, we compared the results in the V4 region and in the 'Global' sample providing detailed summarisation and conclusions in the final chapter.

RESULTS

The financial concentration of the food processing industries (in a wider sense, including food (NACE C10), beverages (NACE C11) and tobacco (NACE C12) segments) was demonstrated in all the V4 countries by the research based on the main selected financial data. We concluded that the shares of the number of selected large companies in financial samples relative to the size of the whole industries were very low (lower than 3 percent in all cases), but the financial relevance of these samples relative to the financial performance of the whole sector regarding revenue, net profit, total asset, equity country by country in V4 region were very high (the shares were higher than 50 percent in all cases), in 2022. The results confirmed our first professional assumption.

Sustainability samples were investigated along the types of documents and the types of companies. Moreover, outstanding subsectors were identified. According to the research results, the majority of the documents assessed were detailed sustainability reports. Most of the reports derived from 'Global' corporations, except for the Polish sustainability sample, where their share was below 50 percent. The following common outstanding subsectors were selected in V4 region

based on the samples: manufacture of vegetable and animal oils and fats (C10.4), manufacture of other food products (C10.8), manufacture of beverages (C11.0).

Main results of the content analyses in V4 countries along taxonomy objectives were as follows. The most relevant taxonomy objectives (above 25.0 relative scores) in the Czech Republic, Hungary and Poland were objectives 1. Climate change mitigation, 3. Sustainable use of water and 6. Protection of biodiversity. While in Slovakia objectives 1. Climate change mitigation, 3. Sustainable use of water and 4. Transition to a circular economy were determinant.

The core question that arose during the research was whether the sample of 'Global' companies yields better relative scores than the results obtained so far for the sustainability samples of individual V4 countries. However, the relative scores of the 'Global' sample were quite similar to the relative scores of the V4 countries' samples per taxonomy objectives. This result suggested that companies produced voluntary reports prepared their documents in a similar professional level to the mandatory reports under the NFRD. It therefore appeared that the competitive situation in the food processing industry influences the content and quality of sustainability reports at least as much as mandatory regulations.

The main results of the content analyses in V4 countries along taxonomy activities were as follows. Regarding the 1. Climate change mitigation objective the arbitrary added 'GHG emission' and a) 'renewable energy' activities were remarkable. Within the 3. Sustainable use of water objective c) 'improving water management and efficiency' activity received the highest relative scores in all countries. Concerning the 4. Transition to a circular economy objective a) 'efficient use of natural resources' was the common outstanding activity in V4 region. In case of the 6. Protection of biodiversity objective the c) 'sustainable agricultural practices' activity was highlighted in all V4 sustainability samples.

Finally, the research team concluded that in addition to regulation, market competition also might play a major role in how companies communicate their environmental and sustainability initiatives, arrangements and monitoring approaches to their stakeholders – particularly to their suppliers regarding sustainable agricultural practices – and how they contribute to a healthier and more liveable future.

We believe that our comprehensive research will significantly increase green awareness for all stakeholders.

1. GENERAL OVERVIEW OF EU REGULATION, SUSTAINABILITY REPORTING AND GREEN FINANCE

Authors: *Judit Hámori, Andrea Rózsa, Ibolya Lámfalusi, Pál Goda*

In this chapter, two main themes are overviewed that underpin the EU's sustainability ambitions. Firstly, the main thrust of EU sustainability regulation is analysed within a historical framework. Then, the emergence and concept of sustainable (green) finance and related legislative and practical initiatives are examined.

1.1. EU SUSTAINABILITY REGULATION

EU sustainability legislation has developed within an international framework. European environmental initiatives have been based on the ideals and objectives of the World Environment Conferences organised by the United Nations and then the annual World Summits of the Conference of the Parties (COPs). Within the EU, the emphasis of environmental and economic policy has changed dynamically, in response to both global developments and internal financial conditions. The vision of a sustainable future for Europe has included acknowledgement of the need to set environmental objectives, sets sustainable agriculture as a development objective, takes into account the new CAP reform, and aims to provide coherence with regard to the financing of environmental protection and development. In the following subchapters, a historical overview, the essence of the new Common Agricultural Policy from an environmental perspective, and the most relevant EU sustainability regulations are presented.

1.1.1. Historical overview

Since the 1970s, with the recognition of the limits of economic growth (Meadows *et al.*, 1972), new approaches towards environmental and social responsibility have emerged that focus on the role of the environment and society rather than solely on economic growth (Goda, 2012). The most important of these approaches were the Human Development Index (HDI) published by the United Nations Development Program (UNDP) in 1990 (Stanton, 2007), the Index of Sustainable Economic Welfare (ISEW) created by Daly and Cobb (1989) and the Genuine Progress Indicator (GPI) developed by Cobb *et al.* (1995).

From the 1970s to the present, the EU has developed **eight environmental action programmes (EAP)** in line with the UN environmental objectives (Pelle, 2008; Pánovics, 2020). The **8th EAP** covers the period 2021-2030 and aims to accelerate the transition towards a climate-neutral, resource-efficient and regenerative economy, based on the premise that healthy ecosystems are critical to human well-being (Decision (EU) 2022/591).

In the period up to the turn of the millennium, the dominance of ideological goals and the development of a theoretical, conceptual framework was in the foreground worldwide, including in the EU. Within the EU, the emphasis on environmental and economic policy has since then changed dynamically, both in response to global trends and to internal financial conditions. Environmental issues have become more prominent in the decade following the turn of the millennium, more closely aligned with the strategic requirements of sustainable development, and four main objectives have been identified: tackling climate change, protecting nature and biodiversity, improving health and quality of life, and efficient use of natural resources and waste management. During this period, there were two CAP reforms which were already strongly influenced by the need to protect the natural environment and improve biodiversity.

In 2004, the UN Global Compact published a report entitled "Who Cares Wins" (Global Compact, 2004). Together with twenty financial institutions, the report made recommendations to the financial industry, hoping to make the environment (E), society (S) and governance (G) more applicable to the fields of analysis, asset management and securities brokerage. It can therefore be said that the ESG approach as a whole started in the financial sector to promote sustainable financial investment and then spread to other sectors (Today ESG, 2025).

In 2015, the United Nation (UN) General Assembly adopted the **"2030 Agenda for Sustainable Development"** with the focus on the **Sustainable Development Goals (SDGs) (Figure 1).** The SDGs balance the economic, social and environmental dimensions of sustainability. A milestone was the adoption of a new global framework for sustainable development under the auspices of the UN for the period up to 2030 and the **Paris Agreement** in 2016, which sets out commitments for both developed and developing countries to control their greenhouse gas emissions and have set a target to keep the global average surface temperature increase below 2°C above pre-industrial levels, and are aiming to limit warming to 1.5°C. The Paris Agreement also states that "the flow of financial resources should be consistent with efforts to reduce greenhouse gas emissions and build resilience to climate change" (Article 2 of Paris Agreement, 2016).

Figure 1

The Sustainable Development Goals (SDGs)

Source: The Sustainable Development Goals Report (2016)

At the end of 2019, the European Commission published its Communication on a **Green Deal for Europe** (COM (2019) 640 final), which aimed to address climate and environmental challenges effectively and now as a matter of priority. The agreement set the goal of climate neutrality for the European Union by 2050 and laid the foundations for a new political and legislative framework around climate and environmental protection.

The European Green Deal proposed new measures in eight policy areas, confirmed by the European Commission in a Communication:[5]

- boost the EU's climate ambition for 2030 and 2050,
- mobilising industry for a green and circular economy,
- a clean, affordable and secure energy supply,
- energy- and resource-efficient construction and modernisation,
- accelerating the shift to sustainable and smart mobility,
- a pollution-free environment free of toxic substances,
- protect and restore ecosystems and biodiversity,
- farm to fork is creating a fair, healthy and environmentally friendly food system.

5 The Investment Plan for a Sustainable Europe (COM(2020) 21 final), the Fair Transition Mechanism (COM(2020) 22 final), the European Climate Agenda (COM(2020) 80 final), the New Industrial Strategy for Europe (COM(2020) 102 final), including Shaping Europe's Digital Future (COM(2020) 67 final), the Action Plan for the Circular Economy (COM(2020) 98 final), the Farm to Consumer Strategy (COM(2020) 381 final) and the Biodiversity Strategy (COM(2020) 380 final).

1.1.2. Common Agricultural Policy

The EU's common agricultural policy came into being in 1962, and its objectives were initially defined primarily by economic and financial concerns, such as increasing productivity, stabilising markets or ensuring a fair standard of living for those who depend on agriculture, in order to ensure food security. The CAP has undergone six major reforms in the last 60 years or so, including the ongoing ones, all of which have placed greater emphasis on environmental objectives. As a result, the sector has struggled to meet ever-increasing green expectations.

In line with the European Green Deal, the European Commission has adopted a fairer, greener and more performance-oriented agricultural policy for 2021-2027 to ensure sustainable agriculture and food production. Under the European Green Deal (2019), 30 percent of EU budget expenditure should be devoted to climate-related objectives, with 40 percent of the total financial envelope of the CAP also contributing to climate objectives under the so-called green architecture. Of particular relevance to CAP reform, the measures proposed in the European Green Deal include the 'farm to fork' strategy, which is of most relevance to agricultural areas, and the new biodiversity strategy adopted on the same day.

The CAP aims to achieve its general objectives through ten specific objectives, in line with the food systems ambitions of the European Green Deal. Three of the nine objectives relate directly to the environment and climate (Table 1) but several more contribute indirectly to climate objectives (EU Regulation 2021/2115). Objective 10 (knowledge transfer, innovation, digitalisation) supports the set of objectives horizontally.

Table 1

Specific objectives of the CAP on environmental sustainability

Environmental sustainability objectives	Contents
Objective 4	To **contribute towards climate change mitigation and adaptation** by, inter alia, reducing greenhouse gas emissions and enhancing carbon sequestration, and promoting **sustainable energy**;
Objective 5	**To promote sustainable development and efficient management of natural resources** such as water, soil and air, including by reducing dependence on chemicals;
Objective 6	**To contribute to halting and reversing biodiversity loss**, enhancing ecosystem services and **conserving habitats and landscapes.**

Source: The authors' own compilation based on EU Regulation 2021/2115

In order to achieve environmental objectives, the European Commission is using a multi-level set of instruments under both Pillars I and II of the CAP, the so-called green architecture, which includes elements such as basic income support for sustainability (BISS), the eco-scheme, and a

number of instruments under Pillar II of the CAP to continue to support the achievement of the CAP's climate and environmental objectives.

1.1.3. Most relevant EU sustainability disclosure regulations

The introduction of the **Non-Financial Reporting Directive** (NFRD, Directive 2014/95/EU) in 2014 was intended to improve transparency and accountability of companies. The scope of the NFRD covers public companies that meet at least 2 of the following criteria:

- Annual net turnover above EUR 40 million.
- A balance sheet total of over EUR 20 million.
- The average number of employees is above 500.

Under the NFRD, a relatively small number of companies were required to report not only on their financial performance but also on the environmental, social and ethical impacts of their activities.

This regulation was replaced by the **Corporate Sustainability Reporting Directive** (CSRD, Directive 2022/2464/EU), which entered into force on 5 January 2023 and replaces the more flexible NFRD regulation with a more detailed reporting obligation for a wider range of companies. In 2025, all large companies of public interest that were previously subject to the NFRD will be required to publish a sustainability report for the reporting year 2024. In 2026, the scope of the CSRD will be further extended to all large companies listed in the European Union that meet at least 2 of the following criteria:

- Annual net turnover above EUR 40 million.
- The balance sheet total is above EUR 20 million.
- The average number of employees is above 250.

Listed SMEs will be required to produce a sustainability report for 2026 from 2027. In the last round, non-EU companies operating in the EU will also be covered and will be subject to the CSRD requirements from 1 January 2028, with the first report due in 2029.

Under the legislation, a company's management report must disclose information necessary to understand the company's impact on sustainability issues and how sustainability issues affect the company's development, performance and position. The sustainability report should explain how the company's business model and strategy are compatible with the transition to a sustainable economy and the limitation of global warming to 1.5°C. The report shall include sustainability targets for at least 2030 and 2050 for the sustainability issues identified by the undertaking, greenhouse gas emission reduction targets, the progress the undertaking has made towards achieving these targets and a statement on whether the undertaking's targets for environmental factors are based on convincing scientific evidence. The document should also include a description of the main risks the company faces in relation to sustainability issues (Lámfalusi *et al.*, 2024).

Under the CSRD Regulation, the application of the **European Sustainability Reporting Standards** (ESRS) is mandatory for companies (EU Regulation 2023/2772). The standards were adopted by the European Commission in 2023 and cover the full range of environmental, social and governance issues, including climate change, biodiversity and human rights. This can inform investors' understanding of the sustainability impact of the companies in which they invest. The ESRS has been developed taking into account existing standards such as International Sustainability Standards Board (ISSB) and Global Reporting Initiative (GRI) standards to ensure interoperability between EU and global standards and to prevent unnecessary double reporting by companies.

In order to achieve Europe's green objectives, the European Commission has set out to facilitate the flow of private financial resources towards sustainable activities. A common understanding of what constitutes environmentally sustainable activities requires a common set of criteria to be defined so that the same criteria are met across EU Member States, thus avoiding "greenwashing" and boosting investor confidence. The **EU Taxonomy Regulation** (EU Regulation 2020/852) aims to define a single set of criteria. The Regulation lists six environmental objectives, to which a significant contribution is one of the basic requirements for an activity to be "green". For each environmental objective, it lists the activities that the company can undertake to contribute to achieving the objective (Table 2).

Table 2

The EU Taxonomy's environmental objectives and the related activities

Objectives	List of activities
1.Climate change mitigation (8 activities)	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.

Table 2

Objectives	List of activities
3. Sustainable use and protection of water and marine resources (4 activities)	a) **protecting the environment from** the adverse effects of urban and industrial **waste-water discharges** (adequate collection, treatment and discharge of urban and industrial wastewaters), b) **protecting human health from** the adverse impact of any **contamination of water** intended for human consumption, c) improving **water management** and efficiency, d) ensuring the **sustainable use of marine ecosystem** services.
4. Transition to a circular economy (11 activities)	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 preparing 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 gasses, 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.**

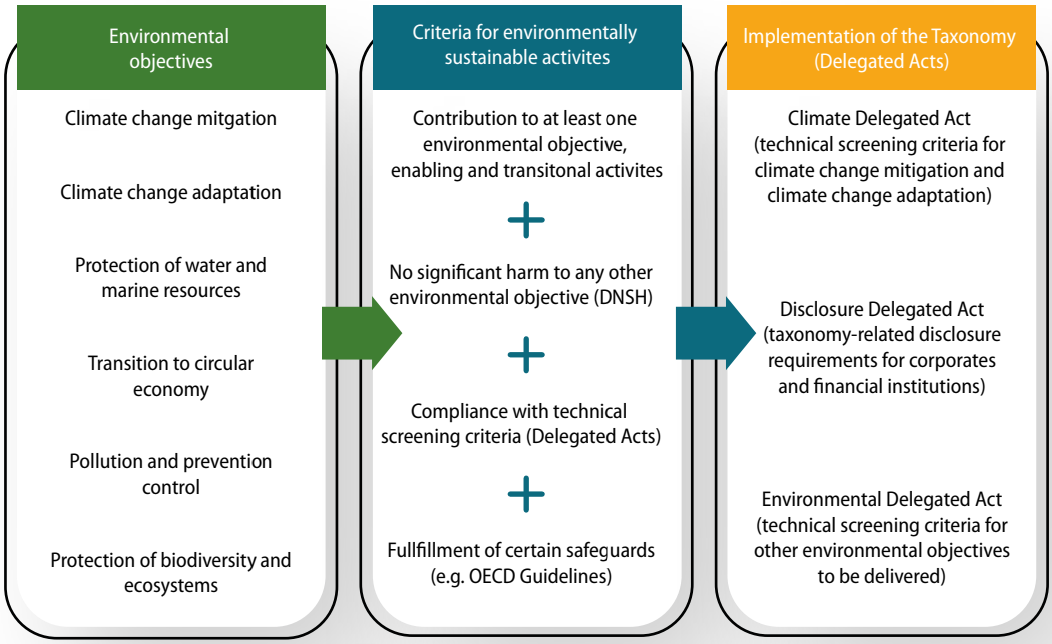
Source: The authors' own compilation based on EU Regulation 2021/2115

Another criterion for sustainable economic activity is that it does not significantly harm any of the environmental objectives (do not cause significant harm, hereafter referred to as the 'DNSH principle'. An economic activity cannot be considered environmentally sustainable if it improves environmental conditions for one objective but has a significant negative impact on another. The requirement for economic activities to meet social standards is that the economic activity is carried out in accordance with minimum safeguards and that this economic activity complies with technical assessment criteria established by the Commission (EU Regulation 2020/852).

The technical screening criteria define at sectoral level what is meant by avoiding significant contribution and significant harm. The technical assessment criteria are set out in Commission Delegated Regulation 2021/2139, but the setting of the technical screening criteria for agriculture and food has been postponed due to ongoing negotiations on the Common Agricultural Policy (and at the time of writing this book they have not yet been published) (Figure 2).

Figure 2

Cornerstones of the Taxonomy



Source: Brühl, 2021, p. 6.

The Taxonomy Regulation and the CSRD Directive together define the content of corporate reporting on environmental sustainability. According to paragraph 8 of the Taxonomy Regulation, companies that are required to disclose non-financial information must include information on how and to what extent the company's activities are related to economic activities that are environmentally sustainable in their reports. The information to be disclosed is set out in detail in Commission Delegated Regulation (EU) No 2021/2178. As regards the content of sustainability reports, CSRD Directive 2022/2464 defines in its Chapter 6A, Article 29b(2)(a), information that meets the taxonomy objectives as environmental factors to be disclosed as part of the sustainability reporting standards. Most important EU legislations regarding sustainability and green financial initiatives are summarised in the next table (Table 3).

However, currently there is not a common framework that all companies use to fulfil their reporting obligations, companies typically report their activities along the three pillars of ESG in their sustainability reports. According to the research of KPMG (2020) the most widely used framework to disclose information on ESG activities is the Global Reporting Initiative (GRI).

Table 3

EU legislative background of sustainability and green finance (in chronological order)

Time of application	Name of Legislation	Topic	Target group
from 2017	NFRD: 2014/95/EU Directive	NFRD / CSRD	non-financial companies
from 2019	EC – Guidelines on reporting climate-related information	NFRD / CSRD	non-financial companies
from July 2020 (with some exceptions)	EU Taxonomy: Regulation (EU) 2020/852	TAXONOMY	non-financial companies, financial market actors
from March 2021 (with some exceptions)	SFDR: Regulation (EU) 2019/2088	SFDR (ESG)	financial market actors
from December 2021 (in stages)	Commission Delegated Regulation (EU) 2021/2178	TAXONOMY	non-financial companies, financial market actors
from January 2022	Commission Delegated Regulation (EU) 2021/2139	TAXONOMY	non-financial companies, financial market actors
from January 2023	SFDR Level 2: Commission Delegated Regulation (EU) 2022/1288	SFDR (ESG)	financial market actors
from January 2023	CSRD: 2022/2464/EU Directive	NFRD / CSRD	non-financial companies, financial market actors
from July 2023	Commission Delegated Regulation (EU) 2023/2486	TAXONOMY	non-financial companies, financial market actors
from July 2023	ESRS: Commission Delegated Regulation (EU) 2023/2772	CSRD	non-financial companies, financial market actors
from July 2024	CSDDD: 2024/1760/EU Directive	CSRD	non-financial companies

Source: Authors' own compilation on the basis of https://www.mnb.hu/greenfinance/zold-jogtar, https://kpmg.com/hu/hu/home/esg/fenntarthatosagi-jogszabalygyujtemeny.html, https://finance.ec.europa.eu/publications/sustainable-finance-package-2023_en

EU Regulation 2019/2088 applies to financial market actors and financial advisors. The Regulation sets out harmonised transparency rules on how financial market participants integrate environmental, social and governance factors into their investment decisions and financial advice and their sustainability efforts, in order to avoid potential greenwashing (Regulation (EU) 2019/2088).

ESG ratings provide an insight into the sustainability profile of a company or financial instrument by assessing its impact on society and the environment, as well as its exposure to risks related to sustainability issues. ESG ratings are mainly developed and distributed by ESG rating providers, but some financial institutions also develop their own ESG ratings. **Regulation (EU) 2024/3005 of the European Parliament and of the Council** introduces a common regulatory approach to enhance the integrity, transparency, comparability where possible, accountability, reliability, good governance and independence of ESG rating activities, thereby contributing to the transparency and quality of ESG ratings and the EU's sustainable finance agenda.

The Directive on Corporate Sustainability Due Diligence (CSDDD, Directive 2024/1760/EU) entered into force in July 2024 and aims to promote sustainable and responsible corporate behaviour in the operations of companies and their global value chain. The Directive applies to companies inside and outside the EU. The CSDDD covers companies in the European Union with more than 1,000 employees and an annual turnover of more than EUR 450 million, as well as companies from third countries with an annual net turnover of EUR 450 million in the European Union.

As the newest plan, the European Commission released its package of simplification **Omnibus I. and II. Proposals**, on February 26th, 2025 (COM (2025) 80 final, COM (2025) 84 final). The new legislation has been introduced with the aim of simplifying corporate sustainability reporting, significantly impacting current sustainability reporting as set out in the Corporate Sustainability Reporting Directive (CSRD), Corporate Sustainability Due Diligence Directive (CSDDD), EU Taxonomy Regulation and Carbon Border Adjustment Mechanism (CBAM). According to the Omnibus proposals, the most important proposed changes to the CSRD are:

- **Timeline:** The entry into application for large companies and listed SMEs (wave 2 and 3) will be postponed by two years.
- **Scope:** Reporting is required only by large corporations with more than 1,000 employees and either a turnover of over EUR 50 million or a balance sheet above EUR 25 million. This new CSRD scope threshold reduces in-scope companies by 80%, similar to the CSDDD.
- **Reporting standards:** The Commission wants to revise the current delegated act of the ESRS, aiming to reduce the number of data points and providing further clarifications. There will be no sector-specific standards.
- **Double materiality:** No changes are planned. Companies that remain in scope of the CSRD will have to report on both dimensions – financial and impact materiality.
- **Voluntary reporting:** Aiming at companies no longer in scope of the CSRD, the commission plans to adopt a delegated act on a voluntary reporting standard, based on the Voluntary Sustainability Reporting Standard for non-listed SMEs (VSME) developed by the European Financial Reporting Advisory Group (EFRAG).

Moreover, The Omnibus proposals also include the following main proposed amendments to the EU Taxonomy Regulation:

- **Scope**: Reporting will be required for companies that fall under the new CSRD scope and additionally exceed a net turnover of more than EUR 450 million. The proposal introduces an "opt-in" regime for those below the threshold of EUR 450 million in net turnover.
- A **financial materiality threshold** will be introduced (e.g., exempting economic activities that are not exceeding 10% of the companies' total turnover or CAPEX).
- **Simplification**: Reporting templates are being reduced and Do No Significant Harm (DNSH) criteria (related to pollution and chemicals) are being simplified.
- The **Green Asset Ratio** (GAR) for banks is being revised.
- The commission wants to publish draft amendments for **public consultation** before final adoption.

The legislative Omnibus package proposed by the Commission will also need the approval of the European Parliament and a qualified majority of Member States. This means that the proposals are not final at this stage and may still be subject to amendments during the political conciliation. The Commission has asked the co-legislators to negotiate the Omnibus package as a matter of priority, in particular as regards the proposal to postpone the transposition deadlines for the CSRD and CSDDD directives.

At the same time, many companies are in the middle of their CSRD roadmap, having invested time and resources in reporting preparation, double materiality assessments, gap analysis and data collection efforts.

More advisory associations believe that it is crucial to stay proactive instead of pausing current ambitions to wait for the shifting regulatory landscape to stabilise. There are more and more global regulations obligating corporate sustainability reporting, and even with the currently proposed simplifications and postponements in the EU, forward-thinking companies will have to integrate sustainability into their business strategy sooner rather than later. The ESRS will remain the gold standard for sustainability reporting, enabling companies to create value and build competitive advantage. This will inevitably become a task that goes beyond compliance.

1.2. BASICS OF SUSTAINABLE AND GREEN FINANCE

Green finance is a new innovation that offers an alternative financing option for individuals, companies and governments willing to finance and invest in green or low-carbon activities. The benefits of green finance include allocating funds to protect the environment, channelling funds towards sustainable trade and investment activities, low-risk financing, and developing green investment and financing instruments. However, green finance is only one aspect of sustainable finance for sustainable development. In addition to green finance, there are other sustainable financing options, such as social finance, blue finance and digital finance (Ozili, 2022).

Ozili (2022) highlights that Zhang *et al.* (2019) in their bibliometric analysis showed that there is no generally accepted definition of green finance. Ozili (2022) aims to compare different green finance concepts. The author selected scientific literature available in Google Scholar after 2010 using the following keywords in the abstracts and in the text of the publications: "green finance, "green bonds", "green financing".

After reviewing the green finance development of G20 countries, Ozili (2022) compiled the following continental comparison of green finance terminologies (Table 4):

Table 4

Specific terminologies for green finance in continents

Continent Common terminologies for green finance	Continent Common terminologies for green finance
North America	Green financial assets; green investment; sustainable finance; green funds; green bonds
South America	Green bank; green bonds; green sovereign bonds
Africa	Green Sukuk; climate finance; green bonds; green climate fund
Oceania	Sustainable finance; green loans; green bonds
Asia	Sustainable finance; green loans, green bonds, green investment
Europe	**Green bonds; sustainable finance; climate finance; green investment; climate awareness bonds**

Source: Ozili (2022), p. 19, Table 2

According to Mohanty *et al.* (2023), green finance is significant because it is the first organised attempt by the financial industry to link financial performance with positive environmental impact. Their study assesses the current status and progress of global scientific research on green finance based on bibliometric methodology: by organising publications, organisations, countries/nations and most cited authors. The authors analysed 1748 publications from the Scopus database using VOS-Viewer software. They summarised which areas and keywords the examined green finance scientific works highlighted, and what main topics and challenges they targeted (Table 5). Along their 6 main questions, (1) they concluded that the amount of green finance research shows an increasing trend, with both the number of publications and citations increasing rapidly; (2) they listed the top 10 most cited and most prominent scientific publications, and the top 10 journals on green finance; and (3) finally, in terms of organisations, it was shown that Jiangshu University in China contributed the most to green finance research, China published the most studies, and through co-authorship, China has the strongest connections and expertise in green finance.

Due to monetary measures, financial incentives and economic pressures green finance frameworks have been developed worldwide, including in the EU, the Central Eastern European (CEE) region and the V4 countries as well. Key documents (e.g. green finance consultation documents of Central Banks, National Circular Economy Strategies, case studies in the field of natured-based solutions, etc.) on green financing frameworks in each country (including EU Member States, CEE and V4 countries) are available on the greenfinanceplatform.org website.[6]

6 https://www.greenfinanceplatform.org/map

Table 5

Most influential articles on green finance

Rank	Authors	Titles	Journal	Total citation
1	Taghizadeh-Hesary and Yoshino (2019)	The way to induce private participation in green finance and investment	Finance Research Letters (Netherlands)	233
2	Zhang *et al.* (2021)	Public spending and green economic growth in BRI region: Mediating role of green finance	Energy Policy (United Kingdom)	186
3	Shen *et al.* (2021)	Do green investment, financial development, and natural resources rent limit carbon emissions? A provincial panel analysis of China	Science of the Total Environment (United Kingdom)	160
4	Zhang *et al.* (2019)	A bibliometric analysis on green finance: Current status, development, and future directions	Finance Research Letters (Netherlands)	151
5	Zhang *et al.* (2011)	Tracking the implementation of green credit policy in China: Top-down perspective and bottom-up reform	Journal of Environmental Management (United States)	150
6	Mohsin *et al.* (2021)	Assessing the impact of transition from non-renewable to renewable energy consumption on economic growth-environmental nexus from developing Asian economies	Journal of Environmental Management (United States)	147
7	He *et al.* (2019)	Green credit, renewable energy investment, and green economy development: Empirical analysis based on 150 listed companies in China	Journal of Cleaner Production (United Kingdom)	145
8	Wang and Zhi (2016)	The Role of Green Finance in Environmental Protection: Two Aspects of Market Mechanism and Policies	Energy Procedia (United Kingdom)	145
9	Taghizadeh-Hesary and Yoshino (2020)	Sustainable solutions for green financing and investment in renewable energy projects	Energies (Switzerland)	129
10	Gianfrate and Peri (2019)	The green advantage: Exploring the convenience of issuing green bonds	Journal of Cleaner Production (United Kingdom)	121

Source: Based on Mohanty et al. (2023), p. 6, Table 2

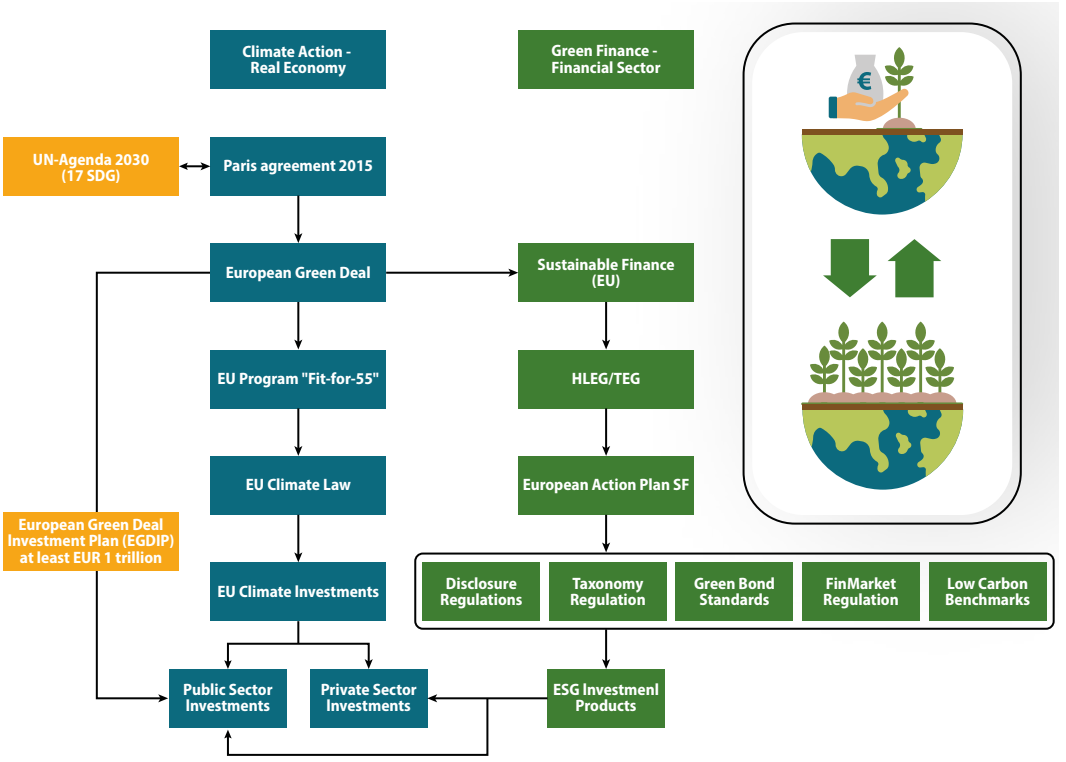
In line with the sustainable, green finance ideology the idea which preceded the EU taxonomy in the European Union was the published action by Commission on 8 March 2018, which is a 'plan on financing sustainable growth, launching an ambitious and comprehensive strategy on sustainable finance. One of the objectives set out in that action plan is to reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth. The establishment of a unified classification system for sustainable activities is the most important and urgent action envisaged by the action plan. The action plan recognises that the shift of capital flows towards more sustainable activities has to be underpinned by a shared, holistic understanding of the environmental sustainability of activities and investments' (Regulation (EU) 2020/852 (6)).

With regard to the European green finance process, Brühl (2021) provides a comprehensive overview of the main EU regulatory initiatives under the European Green Deal (EGD), such as the Tax Regulation, the disclosure framework for companies and financial institutions and other aspects of financial market regulation, which have already significantly improved the regulatory framework for sustainable finance in Europe. However, it also proposes to consider some additional instruments, such as the reform of executive remuneration or tax incentives for green investments in the real economy.

Brühl (2021) illustrates the evolution and the linkages between EU climate initiatives and the relevant key elements of the European Sustainable Finance Strategy to make the necessary green finance feasible (Figure 3).

Figure 3

The interaction between climate protection and green finance in Europe



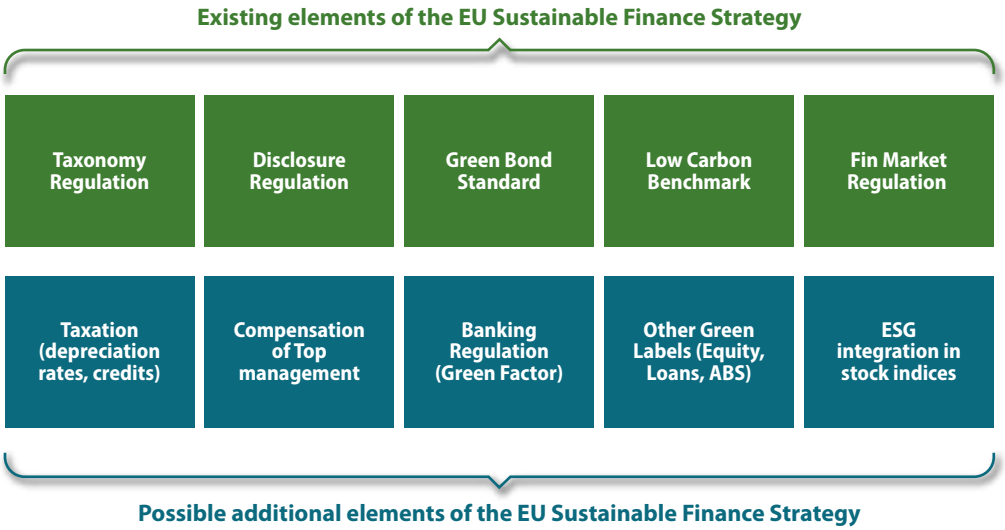
Source: Brühl, 2021, p. 2.

Brühl (2021) also reminds that green finance can be defined as financing investments that bring environmental benefits, such as reducing air, water and soil pollution, reducing greenhouse gas emissions, improving energy efficiency, and mitigating and adapting to climate change. This definition is in line with the Taxonomy Regulation and the objectives of the European Green Deal and is also close to the definition given by the G20 Green Finance Study Group (G20 2016), as green

finance is understood as a subset of sustainable finance. In this context, 'climate finance' refers to the financing of public and private investments that seek to support climate change mitigation and adaptation and can therefore be considered as a subset of green finance (Hong *et al.*, 2020). The following figure by Brühl (2021) gives an overview of the key areas that a sustainable finance strategy should cover (the green boxes in the figure show where the EU is currently in terms of sustainable finance and which elements it covers, and the blue boxes in the figure show some additional elements that could complement the existing strategy (Figure 4).

Figure 4

Sustainable Finance Strategy in Europe



Source: Brühl, 2021, p. 5.

Drawing on the OECD (2020) report in Brühl (2021), the author also highlights that taxonomy is a key element of the European sustainable finance strategy, as it has implications for both the disclosure regulation of financial institutions and companies and the standard for green bonds. In terms of the granularity and precision of the definitions of sustainable activities and the technical criteria to be met, the EU taxonomy is by far the most advanced taxonomy compared to other alternatives on the market.

Brühl (2022), in another study, provides a critical assessment of the current EU regulatory framework. He points out that the current sustainable financing in Europe leads to ambiguous results. In his view, although the level of transparency on environmental, social and governance aspects of financial products has improved, it is questionable whether the complex, mainly disclosure-oriented architecture is sufficient to mobilise more private capital for sustainable investments. It is proposed to discuss whether a minimum taxonomic ratio or a Green Asset Ratio should be met in order for a financial product to be launched as 'green'. Furthermore, due to the complexity of

regulation, private investors may benefit from a simplified green rating based on the taxonomic ratio to facilitate the selection of green financial products.

Global awareness of the risks of climate change is focusing attention on new financial instruments, including green bonds, which finance environmentally friendly projects. In this context, these bonds are becoming viable financial instruments, the proceeds of which are used exclusively to finance eligible projects. A study by Hadaś-Dyduch *et al.* (2022) characterises the **green bond market in the V4 countries** and identifies the key drivers and benefits of green bond issuance. The specific aim of the research was to analyse the spatial and temporal patterns of green bond returns in the V4 countries, using literature source analysis and report analysis, statistical data analysis from international financial markets and the so-called Dynamic Time Warping (DTW) method. The study examined only 20 green bond issues in the Visegrad countries (nine green bonds in the Czech Republic, two in Hungary, one in Slovakia and eight in Poland). In the V4 countries, the main issuers of green bonds are the public sector (66% of total issuance in Poland and 86% in Hungary) and state-controlled companies (the largest bank and the largest oil company in Poland). In the Czech Republic and Slovakia, the issuers are companies. Public sector activity is essential for the development of the green bond market, as it is primarily governments and the companies that depend on them that should be striving for sustainability and investing in this area. This is a necessary but not a sufficient condition. Greater attention should be paid to private companies (financial and non-financial institutions), which should be interested in raising capital by issuing green bonds when implementing climate protection investments. This requires the European Parliament to adopt appropriate legislation, in particular on the qualification of investments and the conditions for issuance (Hadaś-Dyduch *et al.*, 2022).

As mentioned earlier, the greenfinanceplatform.org (https://www.greenfinanceplatform.org/map) website contains detailed green finance-related documents on Central Banks' initiatives, other relevant green growth policies, available green products, projects, indicators, circular national strategies and successful nature-based case studies:
Czech Republic: https://www.greenpolicyplatform.org/country/czech-republic,
Hungary: https://www.greenpolicyplatform.org/country/hungary,
Poland: https://www.greenpolicyplatform.org/country/poland,
Slovakia: https://www.greenpolicyplatform.org/country/slovakia.

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2. OBJECTIVES

Authors: *Andrea Rózsa, Judit Hámori, Ibolya Lámfalusi, Pál Goda*

Realisation of the EU's green goals is particularly important for the food industries of V4 countries. A uniform system of criteria is needed for the development of environmentally sustainable activities. After the NFRD and EGD, the EU Taxonomy was the next fundamental step to create principles of this system. The objectives of Taxonomy became a defining element of CSRD as well. The main aim of the project led by AKI is to provide comprehensive knowledge about the current situation and future opportunities of food industries' sustainable goals and activities in V4 countries to promote environmental-friendly solutions. The cooperation of V4 countries is important from geographical and financial point of view as well. This planned examination addresses both a knowledge gap and an urgent need. The common target is to find the most effective solutions for the sustainable improvement of the food industries in our region and to achieve determining behaviour-changing effects. We will focus on strengthening macroregional and sectoral cooperation by a taxonomy-centred, qualitative and quantitative analysis of voluntary and mandatory sustainability reports of large companies in food processing industries using sectoral financial database. We plan to accomplish unique scientific studies and to provide new, outstanding information for key stakeholders (experts, companies, financiers, consumers, political decisionmakers) to realise more effective changes within the green transition. According to our scientific concept, the planned transparent assessment can also reduce the problem of greenwashing.

The main aim of our research is to conduct a detailed qualitative content analysis of sustainability documents published on mainly voluntary online platforms in the selected V4 food processing industry sectors, focusing on the relationships (similarities and differences) between taxonomy objectives and activities.

The present study is a further improvement and elaboration of our previous Hungarian research (Lámfalusi *et al.* (2024)), which focuses on a broadened and extended research to V4 countries, using a similar sample selection approach and the same scoring methodology.

The book aims to examine the online sustainability reporting practices of dominant large companies in V4 food processing industries from EU taxonomy perspective when the NFRD is still in force, but the CSRD is already known.

The **main research steps** are as follows:

1. selection of sample companies and proving their financial relevance for the whole food industry in every investigated country;

2. description of the scoring criteria developed for the content analysis of the online available sustainability reports and the associated point-scale formula;
3. presentation of a company case study to illustrate the applicability of the relative scoring mathematical formula;
4. specification of the examined time interval, types of sustainability reports and types of companies in the sample and definition of so-called 'Global' companies;
5. presentation of the scientific results of V4 countries in separate chapters which are divided into three parts:
   - literature review,
   - financial relevance of the sample relative to the whole food industry proving the financial concentration of this sector,
   - presentation of the scientific results regarding the comprehensive assessment, i.e. the content analysis of the online available sustainability reports from the EU taxonomy standpoint using the developed relative scoring formula;

6. evaluation of a 'Global' sample derived from V4 countries and comprehensive assessment of this group of companies from an EU taxonomy perspective using the same relative scoring formula;
7. presentation of consequences, summarisation and evaluation of the regional results, identification of similarities and differences among the V4 countries and 'Global' companies,
8. finally, the paper concludes with a discussion of the limitations of the research and potential future directions for further development.

3. METHODOLOGY

Authors: *Andrea Rózsa, Judit Hámori, Ibolya Lámfalusi*

In this chapter, the methodological bases of the research are presented, step by step, in three subchapters. As the first step, in the applied method subchapter, selection of the samples and theirs financial characteristics are shown. After that, in the same subchapter, the scoring approach developed for the content analysis of online available sustainability reports is explained in detail and finally, the specific relative formula created for the purposes of the current research is outlined. In the second subchapter, a case study is presented as an illustration of the applicability of our scientific approach. As the last step, in the third subchapter, the types of sustainability documents that are available online are detailed, together with investigated companies.

3.1. APPLIED METHOD

Selection of the samples and verification of financial concentration

In this study, large food processing companies filing corporate tax returns in V4 countries were examined in subsector groups for the years 2021 and 2022. Given that the project – which constituted the first phase of the research – started in 2023, the latest available financial reporting data was for 2022.

The following sectors and subsectors were covered in the research, based on the international NACE codes:[7]

Manufacture of food products (C10)
- Processing and preserving of meat and production of meat products (C10.1)
- Processing and preserving of fish, crustaceans and molluscs (C10.2)
- Processing and preserving of fruit and vegetables (C10.3)
- Manufacture of vegetable and animal oils and fats (C10.4)
- Manufacture of dairy products (C10.5)
- Manufacture of grain mill products, starches and starch products (C10.6)
- Manufacture of bakery and farinaceous products (C10.7)
- Manufacture of other food products (C10.8)
- Manufacture of prepared animal feeds (C10.9)

Manufacture of beverages (C11)
- Manufacture of beverages (C11.0)

7 https://ec.europa.eu/competition/mergers/cases/index/nace_all.html

Manufacture of tobacco products (C12)

- Manufacture of tobacco products (C12.0)

For the research the whole database was purchased from the 'Céginfomáció.hu Kft.'.[8] In accordance with Article 3 of Directive 2013/34/EU, large companies were selected if any two of the following three indicators exceeded the following thresholds in the last two financial years: (1) total assets of EUR 20 million, (2) annual net revenue of EUR 40 million, (3) average number of employees in the financial year of 250. Based on the legal criteria and the database:

- in Czech Republic a total of 69 companies were included in the selected group,
- in Hungary a total of 86 companies were included in the selected group,
- in Poland a total of 337 companies were included in the selected group,
- in Slovakia a total of 32 firms were included in the selected group.

In the next step, we examined the shares of the selected groups (called financial samples) relative to the whole sector, moreover the aggregate value of the main financial indicators of the groups in relation to the whole sector (Table 6).

Table 6

Main characteristics of the selected large companies in relation to the whole sectors in V4 countries in 2022

Designation	Czech Republic	Hungary	Poland	Slovakia
Number of large companies (financial samples)	**69**	**86**	**337**	**32**
Number of companies in the whole sector	**13,039**	**7,123**	**19,198**	**6,015**
Manufacture of food products (C10.0)	*9,890*	*4,951*	*18,380*	*4,895*
Manufacture of beverages (C11.0)	*3,137*	*2,169*	*790*	*1,117*
Manufacture of tobacco products (C12.0)	*12*	*3*	*28*	*3*
Shares of the large companies to the whole sector	**0.5%**	**1.2%**	**1.8%**	**0.5%**
Net revenue shares of the large companies	**68%**	**67%**	**77%**	**48%**
Net profit shares of the large companies	**71%**	**62%**	**65%**	**71%**
Total asset shares of the large companies	**73%**	**62%**	**78%**	**52%**
Equity shares of the large companies	**76%**	**53%**	**81%**	**60%**

Note: private enterprises are also included in the whole number of companies in food, beverages and tobacco industries
Source: Authors' own calculation based on the data derived from the purchased database: www.ceginformacio.hu, www.crefoport.hu, and using database of https://ec.europa.eu/eurostat/databrowser/view/sbs_ovw_act__custom_15475826/default/table?lang=en

8 www.ceginformacio.hu, www.crefoport.hu

It can be stated that while the selected large companies represent less than 2.0% of the total number of companies in the sector in all V4 countries, they represent more than 50.0% of the major financial indicators in all cases.

Consequently, it is proven that the food processing sectors – in a wider sense, including manufacture of food products, beverages and tobacco products – in all V4 countries are characterised by financial concentration.

Detailed analyses, including subsectors, are presented in separate country chapters later.

It should be noted that of the large companies selected, only those for which an online sustainability report was available were analysed using the scoring methodology described in the following subsection.

Scoring methodology

The methodology used is based on the scoring approach of the AKI-directed Hungarian preresearch regarding the content analysis of the online available voluntary non-financial sustainability reports and documents in terms of EU Taxonomy (Regulation (EU) 2020/852) perspective in Hungarian food processing industry based on the Non-financial Reporting Directive (NFRD, Directive 2014/95/EU) regulation which was in force in 2022. This research has finished in July 2023 and published in Quality & Quantity international scientific Springer journal in spring 2024 (Lámfalusi *et al.* (2024)).

The scoring method applied by our research group is based on the procedures of Habek and Wolniak (2016), Hoffmann *et al.* (2018) and Lautermann and Stropahl *et al.* (2021). This revised and modernised scoring approach was used for the content analysis of the selected online available sustainability reports and documents (Lámfalusi *et al.* (2024)). In accordance with the objectives and detailed activities defined in EU Regulation 2020/852, the EU taxonomy-related information in each company's sustainability report was identified according to the order within the Regulation. Moreover, the *1. Climate change mitigation* objective has a total of eight activities (indicated by letters) in the Taxonomy Regulation, however, as a specific numerical value can be assigned to '**Greenhouse gas emissions (GHG)'**, this was assessed as a separate activity (listed first in the relevant figures without an indication). The same was done for the objective for the *4. Transition to a circular economy*, as in some sustainability reports the **'Circular economy (CE)'** was mentioned by name, so here too an additional activity was added, relative to the taxonomy (Table 7).

Table 7

Environmental objectives of the taxonomy and related activities have been supplemented by the two additional activities (GHG, CE)

Objectives	List of widened 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 c**lean 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 c**ontribute 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 **waste-water discharges** (adequate collection, treatment and discharge of urban and industrial wastewaters), b. **protecting human health from** the adverse impact of any **contamination of water** intended for human consumption, c. improving **water management** and efficiency, d. 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 preparing 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 gasses, 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: Authors' own compilation on the basis of Taxonomy Regulation (EU) 2020/852

Consequently, we had 6 main taxonomy objectives and 35 (i.e. 2+33) taxonomy activities. The content information of sustainability reports regarding all the activities were then rated according to their quality on a scale of 0 to 3, in line with the standard four-points scale of IÖW (2021, p. 29-30) parameters for environmental responsibility (p. 103, p. 110). In the current research the four-points scale has been defined in the following way in line with our Hungarian pre-research (Lámfalusi *et al.* (2024)):

- 0 points: no information
- 1 point: only textual information
- 2 points: simple numerical value (e.g., numerical value for a given year without comparison)
- 3 points: numerical values expressing progress - baseline, current year, future target, which complies with Article 1, Part 4.2(b) of the CSRD Regulation.

If a report contained information of varying quality related to a taxonomy activity, resulting in multiple values, the highest scoring information was used. The maximum number of points that could be assigned to a taxonomy activity was 3. Thus, the points assigned to each objective could be from minimum 6 (*2. Climate change mitigation*) to maximum 36 (*4. Transition to circular economy*), depending on the number of activities within a specific objective (Table 8). If a company report had included the highest level of information for each taxonomy activity, it would have scored 105 points.

Table 8

Maximum absolute scores per company for EU taxonomy objectives

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

Source: Own compilation of the authors

It should be noted that of the large companies selected, only those for which an online sustainability report or environmental sustainability document was available were analysed using the scoring methodology described in this subchapter and later during the scientific process. It means that in all V4 countries the sample of companies for which the scoring methodology regarding content analysis could be applied has become narrower. In the following table (Table 9), the number of large companies with an online available sustainability report in each country is indicated by $C_{v.}$

Table 9

Maximum absolute scores per country's sample for EU taxonomy objectives

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

Note: C_v means the number of selected large companies with online available sustainability reports in V4 countries.
Source: Own compilation of the authors

In the previous subchapter, it was shown that the following companies (so-called financial samples) were selected on the basis of the financial-legal criteria:

- in Czech Republic a total of 69 companies were included in the selected group,
- in Hungary a total of 86 companies were included in the selected group,
- in Poland a total of 337 companies were included in the selected group,
- in Slovakia a total of 32 firms were included in the selected group.

At the same time, only narrower samples (indicated by C_v) were characterised by online available sustainability reports. The reason for this fact is that according to the NFRD, only companies with more than 500 employees and public interest are required to produce mandatory sustainability report, so in the V4 countries there are still a majority of companies that publish online voluntary reports or have not yet produced any.

Consequently, the number of large companies identified by our V4 research team that had an online sustainability report or environmental sustainability document was as follows (C_v):

- in Czech Republic $C_C = 21$,
- in Hungary $C_H = 46$,
- in Poland $C_P = 31$,
- in Slovakia $C_S = 12$.

These narrower samples were called as sustainability samples.

It is important to explain that due to the outstanding size of the Polish sample, we tried to collect the most significant companies, thus the Polish analysis is comprehensive and of high quality but could be possibly expanded in the future.

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

Formula (1)

$\boldsymbol{P_t}$**: relative score** of the t. taxonomy objective:

$$P_t = \frac{\sum_{i=1}^{\boldsymbol{C_v}} \sum_{j=1}^{n_t} x_{ij}}{n_t * 3 * \boldsymbol{C_v}} * 100$$

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

n_t: number of activities within the t. taxonomy objective, $\sum_{t=1}^{6} n_t = 35$ (Table 8)

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 report per country

$\boldsymbol{C_v} \in \{\boldsymbol{21}, \boldsymbol{46}, \boldsymbol{31}, \boldsymbol{12}\}$: number of large companies with online sustainability report 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

3.2. CASE STUDY

The qualitative assessment of a sustainable report's content (scoring 0-3) and the use of Formula (1) described in the methodology section are presented through the sustainability report (2022) of a Hungarian located, majority foreign-owned meat processing (NACE C10.1) company, 'Kometa'. For space and clarity reasons, only those activities of the taxonomy objectives were included where the enterprise had an assessable activity, thus the score was not 0 (Table 10).

Table 10

Absolute scores of Kometa from Hungarian meat processing subsector (2022)

Taxonomy objectives and list of widened activities	Information from the sustainability report	Scores
1. Climate change mitigation		**8**
Greenhouse gas emissions (GHG)	GHG emissions intensity, total emission intensity (Scope 1, Scope 2): -12% reduction in Scope 1, in details page 44. (2022-2020) – numerical values (GRI 305)	2
a) renewable energy (using, generating, transmitting etc.);	New or existing investments for the acquisition, development, construction and/or installation of solar PVs. Kometa estimates that by 2026, 18% of its electricity needs will be covered by solar panels (page 18). Kometa has set a target to install 4.2 megawatts (MW) of solar panels by 2025, which will cover 20% of its current electricity consumption (page 43). – numerical values	2
b) improving energy efficiency;	Financing of renovation of low-energy properties that achieve: at least a 30% decrease in overall energy consumption, or; the required energy efficiency in line with the applicable national building code for newly built properties (and at least a 20% energy efficiency improvement), or; a two-grade upgrade in the local energy performance label, resulting in at least a 20% decrease in emissions, or 20% improvement in energy performance (page 18). Upgrading various air compressors with inverter control functions to optimise their operation and increase energy efficiency (page 43). – numerical values	2
g) establishing energy infrastructure for decarbonisation;	An Integrated Management System is a collection of interconnected or interrelated elements used for managing and controlling an organisation's environmental and energy-related aspects. Specifically, Kometa's IIR is aligned with Hazard Analysis and Critical Control Points (HACCP), ISO 14001:2015 (Environmental Management), ISO 50001:2018 (Energy Management), customer requirements, and national and European regulations (page 40). – numerical values	2
2. Climate change adaptation		**0**
3. Sustainable use and protection of water and marine resources		**4**
a) protecting the environment from the adverse effects of urban and industrial wastewater discharges;	Wastewater discharge by pollutant (2022), page 47. – detailed numerical values	2
c) improving water management and efficiency;	GRI 303: Complex water management, Water and Effluents: reduce water consumption and wastewater emissions, reduction of water withdrawals, management of water-related risks, efficient management of water and/or wastewater discharge from animal production and cleaning processes, with a view to introducing circular practices (page 25, 45-46). – detailed numerical values	2
4. Transition to a circular economy		**9**
Circular economy (CE)	Kometa has entered into a partnership with a contractor specialising in the recycling of each type of Category 2 by-product, creating a genuinely circular process (page 50). - text	1

Table 10

Taxonomy objectives and list of widened activities	Information from the sustainability report	Scores
a) uses natural resources in production more efficiently, including: i) reducing the use of primary raw materials or increasing the use of secondary raw materials or ii) resource and energy efficiency measures;	Kometa places particular emphasis on emissions, energy efficiency, (wastewater discharge, waste management), and the responsible use of raw materials and natural resources (page 40). - text	1
c) increases the recyclability of products	80% of recycled material content in packaging cardboard (page 37). In total, almost 1.500 tonnes of by-products, such as bones, offal, and fat, were recycled on site in 2022 (page 50). – numerical values	2
d) reduces and substitutes of hazardous substances	Waste generated (hazardous, non-hazardous). Weight of non-hazardous waste directed to disposal (t), 2020-2022 (page 48-50). – figures year by year, comparison, target. To safeguard employees and local communities from hazardous substances used and stored, such as ammonia, Kometa has implemented a Damage Control Plan (page 66).	3
f) increases the use of secondary raw materials and their quality;	In 2021, the company established a by-product plant in Kaposvár, with the primary goal of directly recycling slaughter by-products and treat in-house Category 3 waste. This facility comprises four key components, a supply system, a raw material transfer system, a processing technology plant, and a unit dedicated to eliminating process-related odours and the waste treated are mostly parts that are not suitable for human consumption (page 50). – text	1
h) increases preparing for the re-use and recycling of waste (e.g. packaging);	Sustainable packaging (GRI 3-1, 3-2), middle level relevance (page 23). Explore novel packaging solutions (page 35). – text	1
5. Pollution prevention and control		**2**
a) preventing or reducing pollutant emissions into air, water or land, other than greenhouse gasses	There was no continuous, intermittent or exceptional water pollution during the year (page 47). – text	1
c) preventing or minimising any adverse impact on human health and the environment from the production, use or disposal of chemicals;	It is important for meat companies to implement comprehensive policies and procedures aimed at significantly reducing and preventing occupational exposure to these health hazards (page 56). – text	1
6. Protection and restoration of biodiversity and ecosystems		**1**
c) sustainable agricultural practices (enhancing biodiversity or preventing the degradation of soils, other ecosystems, deforestation);	Letter to stakeholders: [GRI 2-22] Statement on sustainable development strategy, Among Kometa's core principles, HonestFood stands as a cornerstone of its commitment to creating value across the entire supply chain. This integral concept represents Kometa's dedication to transparency, ethical practices, and sustainable engagement at every stage of their operations. Stimulating a dialogue with the actors in the food production chain to promote fair and sustainable production practices (page 4). – text	1
Total (sum)		**24**

Source: own compilation of the authors based on the company's online available sustainability report: https://www.kometa.hu/docs/report/Kometa_Sustainability_report_2022_final.pdf

We have already mentioned that in Hungary, 46 out of 86 companies selected on the basis of financial indicators had sustainability information available online. Or, in other words, the number of the firms in the Hungarian sustainability sample was 46.

Consequently, in case of Formula (1)

$$\boldsymbol{C_v = C_H = 46}$$

Furthermore, if we consider 1. Climate change mitigation objective, 1+8=9 activities are included within this (Table 9). It means that in Formula (1)

$$n_t = n_1 = 9$$

Thus,

$\boldsymbol{P_1}$**: relative score** of the 1. taxonomy objective regarding $\boldsymbol{C_H = 46}$:

$$P_1 = \frac{\sum_{i=1}^{\boldsymbol{C_H}} \sum_{j=1}^{n_1} x_{ij}}{n_1 * 3 * \boldsymbol{C_H}} * 100$$

i.e.

$$P_1 = \frac{\sum_{i=1}^{\boldsymbol{46}} \sum_{j=1}^{9} x_{ij}}{9 * 3 * \boldsymbol{46}} * 100$$

It means that $\boldsymbol{P_1}$ shows the summarised relative score of the assessed 46 Hungarian companies for 1. Climate change mitigation objective.

Concretely, in the case of Kometa:

$\boldsymbol{P_{1,Kometa}}$**: relative score** of the 1. taxonomy objective regarding Kometa:

$$\boldsymbol{P_{1,Kometa}} = \frac{\sum_{j=1}^{9} x_{Kometa,j}}{9 * 3} * 100 = \frac{8}{27} * 100 = \boldsymbol{29.6}$$

Similarly,

$$P_{2,Kometa} = \frac{\sum_{j=1}^{2} x_{Kometa,j}}{2 * 3} * 100 = \frac{0}{6} * 100 = 0.0$$

$$P_{3,Kometa} = \frac{\sum_{j=1}^{4} x_{Kometa,j}}{4 * 3} * 100 = \frac{4}{12} * 100 = 33.3$$

$$P_{4,Kometa} = \frac{\sum_{j=1}^{12} x_{Kometa,j}}{12 * 3} * 100 = \frac{9}{36} * 100 = 25.0$$

$$P_{5,Kometa} = \frac{\sum_{j=1}^{4} x_{Kometa,j}}{4 * 3} * 100 = \frac{2}{12} * 100 = 16.7$$

$$P_{6,Kometa} = \frac{\sum_{j=1}^{4} x_{Kometa,j}}{4 * 3} * 100 = \frac{1}{12} * 100 = 8.3$$

Finally, when we have 46 companies in Hungary, firstly we have 46 absolute scores of the 1. taxonomy objective (1. Climate change mitigation) based on the order of 46 companies. We can summarise these absolute scores and then we can calculate the relative score of 1. taxonomy objective, as it was formulated earlier:

$$\boldsymbol{P_1} = \frac{\sum_{i=1}^{\mathbf{46}} \sum_{j=1}^{9} x_{ij}}{9 * 3 * \mathbf{46}} * 100 = \frac{359}{27 * \mathbf{46}} * 100 = \mathbf{28.9}$$

It may be trivial to note that the highest relative score according to the methodology could be 100, but it is clear that even the companies that are required to report in the industry under review do not perform outstandingly across all activities in relation to a selected taxonomy objective. In conclusion, it is clear and self-evident, that the higher the relative score of the sustainability samples regarding the t. taxonomy objective, the better the content value of the t. taxonomy objective.

It is important to note that the main purpose of the analysis was to obtain aggregate results for the samples of companies by calculating the relative scores of the each V4 sample for each taxonomy objective and activity. Company data are not published in this study, but to calculate the aggregate results for each V4 samples, it was necessary to calculate every company's relative scores in exactly the same way as it has presented for Kometa.

To ensure accuracy, cross-control feedback and potential corrections of calculations were provided by having members of the research team check each other's work.

3.3. TYPES OF SUSTAINABILITY REPORTS AND EXAMINED COMPANIES

Although the sample selection was based on financial data for the years 2021 and 2022, the timeframe for the sustainability reports and documents available online was extended to 2021-2023.

The following online sustainability documents were examined using content analysis and relative scoring methodology:

- detailed sustainability report (relatively long pdf document with international standards: GRI, TCFD, SASB);
- simplified sustainability report (shorter but comprehensive pdf document, generally with detailed figures regarding the most important environmental or sustainability topics);

- other environmental document (one or more short documents covering only certain environmental or sustainability topics (e.g. energy or waste management));
- detailed website with figures (the case where sustainability information cannot be downloaded as a pdf document, but more or less detailed descriptions and data on sustainability topics are provided on the website).

Most of the sustainability information and reporting was voluntary, but for some large, listed companies, reporting was mandatory due to NFRD regulations.

In the case of the investigated companies, we distinguished three types in the study:

- independent company (typically a domestically owned company, without subsidiaries);
- subsidiary company (typically a large foreign-owned company or group of companies with subsidiaries in one or more V4 countries);
- parent company (typically a large domestically or foreign-owned company with subsidiaries in other countries).

In order to properly differentiate between parent companies and subsidiaries, we had to handle the case where both the international parent company and its subsidiary in a V4 country prepare a sustainability report.

In most cases, the parent company's sustainability report was of a higher standard than that of its subsidiary. There were also cases where the subsidiary did not prepare an environmental report at all but used the parent company's one.

Consequently, the research team decided that in cases where the parent company of a subsidiary in a V4 country prepares a sustainability report, the research group will choose the parent company's report for the content analysis. These companies were given special attention during the research and were indicated by the name of 'Global'. Almost half of the so-called 'Global' companies were listed companies and so prepared a mandatory sustainability report in accordance with the NFRD regulation.

It is important to note that both the NFRD and the CSRD Regulation exempt from the obligation to prepare a separate sustainability report subsidiaries whose parent company includes the subsidiary in its consolidated sustainability report prepared in accordance with the sustainability reporting standards. In view of this regulation, the sustainability reporting of the parent company for subsidiaries of global companies included in the sample of companies in each country has been analysed.

For a more complete understanding of the 'Global' terminology, we list some of these companies here, without claiming to be exhaustive: Bonduelle, Bunge, Cloetta, Coca-Cola, Danone, Kofola, Mondelez, Nestlé, Kofola, Pepsi, Philip Morris, Tate & Lyle.

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THE STRUCTURE OF V4 COUNTRIES' RESEARCH

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In the following chapters (from Chapter 4 to Chapter 8), the results of secondary and primary research on the V4 countries are presented country by country, adapted to the specificities of each country. The chapters are divided into the following subchapters.

The literature review subchapter discusses the regulatory background, the green financing practices and relevant achievements of the country concerned, according to national specificities. This is followed by the presentation of previous research findings on the sustainability reporting practices of the country concerned.

Following the literature review subsection, the financial performance and financial relevance of the sampled companies in the country in relation to the sector as a whole is presented, using the main financial data, broken down by subsector.

In the Results subsection, the results of the primary survey in the country are presented. First, we present the types of sustainability reports available online and their distribution in the country sample. The results of the assessment of the sustainability reports according to the methodology described earlier are then presented in terms of the environmental objectives of the Taxonomy Regulation and the activities related to the objectives.

Following the results for each country, a separate evaluation of the sustainability reports of 'Global' companies is presented in Chapter 8. This is considered important because we assume that multinational companies are more advanced in sustainability reporting, either because they may have been covered by the NFRD, or because they are strongly motivated by market needs and can devote more resources to sustainability reporting.

4. CZECH REPUBLIC

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This chapter summarises the results of three main themes of our V4 research in case of the Czech Republic.

In the first subchapter, literature review regarding green finance, ESG-related national regulations and sustainability reporting practices is presented. After that, financial concentration of the analysed industry is proven. In the third subchapter, detailed relative scoring results of the content analysis of sustainability sample are presented for the Czech Republic in terms of taxonomy objectives and activities.

4.1. LITERATURE REVIEW

Introduction

Green finance and sustainability reporting have emerged as critical components of modern business practices, driven by increasing awareness of environmental, social, and governance issues. In the context of the European Union (EU), directives such as the Non-Financial Reporting Directive (NFRD) and the Corporate Sustainability Reporting Directive (CSRD) have significantly influenced corporate reporting standards. This literature review explores the regulatory landscape of green finance, focusing on the Czech Republic's sustainability reporting practices, particularly within the agri-food sector, and examines the motivations and challenges companies face in this transition.

Green finance and national regulations

Green finance refers to financing investments that provide environmental benefits, including projects in renewable energy, energy efficiency, pollution prevention, and sustainable agriculture (European Commission, 2020). The EU's commitment to achieving a carbon-neutral economy by 2050 underpins its green finance initiatives, reflected in regulations like the EU Taxonomy Regulation (EU 2020/852). This regulation establishes criteria for environmentally sustainable economic activities, aiming to create a unified classification system across member states.

The EU Taxonomy outlines six environmental objectives: climate change mitigation, climate change adaptation, sustainable use of water resources, transition to a circular economy, pollution prevention, and biodiversity protection (European Commission, 2020). These objectives ensure

that investments align with the EU's environmental goals. Companies must report how their activities contribute to these objectives, adhering to the "do no significant harm" (DNSH) principle and meeting technical screening criteria set by the European Commission.

Implementing these directives in the Czech Republic has been gradual but progressive. Czech regulations are harmonised with EU standards, promoting transparency and accountability in sustainability practices. Large companies and public interest entities must include non-financial statements in their annual reports detailing their impact on ESG issues (Ministry of Industry and Trade of the Czech Republic, 2023). The Czech National Bank has also been crucial in promoting green finance. The bank has integrated green finance principles into its policies, encouraging financial institutions to support environmentally sustainable projects (Pánek & Hladká, 2020).

Veselý and Havel (2015) examine the regulatory environment for sustainable finance in the Czech Republic. The study evaluates the effectiveness of existing policies and identifies areas for improvement. The authors argue that while regulatory frameworks exist, they are often insufficiently enforced and lack coherence. They suggest that a more robust and integrated regulatory approach is necessary to support sustainable finance initiatives. The article provides specific recommendations for policymakers to enhance the regulatory landscape and encourage greater investment in sustainable projects.

Novotný and Poláková (2018) explore the development of green finance in the Czech Republic, focusing on the challenges and opportunities it presents. Their article discusses the role of green bonds and sustainable investment funds in promoting environmental sustainability. The authors identify key obstacles to the growth of green finance, including market immaturity and regulatory gaps. They also highlight the potential benefits of green finance for both investors and the broader economy. Recommendations are provided for enhancing the regulatory environment to support the growth of green finance in the Czech Republic.

Pernica and Jílková (2022) examined the development and adoption of green finance instruments in the Czech Republic. The authors focus on the role of green bonds and sustainable investment funds in promoting environmental sustainability. They discuss the regulatory framework supporting green finance and analyse the economic implications of these instruments for investors and financial markets. The study finds that while there is growing interest in green finance, there are still challenges related to market maturity and regulatory clarity.

Kameníček and Novák (2023) assessed the sustainability of public finances in the Czech Republic. They provide a comprehensive definition of fiscal sustainability and examine various indicators used to assess it. The study evaluates the impact of demographic changes and long-term economic projections on the resilience of Czech public finances, highlighting the importance of sustainable fiscal policies for economic stability. The research addresses potential risks associated with unsustainable fiscal practices and offers recommendations for policymakers to ensure long-term fiscal health.

Sustainability reporting practices in Czech Republic

Czech companies, now bound by new ESG rules, must publish a sustainability report alongside their 2024 financial statements. This report must detail their environmental impact, social responsibility, labour practices, governance, and anti-corruption efforts, giving stakeholders a clear view of their sustainability progress.

Enforcing the Corporate Sustainability Reporting Directive (CSRD) within Czech legislation entails a phased approach to ESG reporting obligations, contingent on company size. Commencing in 2024, this requirement applies to entities deemed of public interest, large accounting units regardless of their public interest status, and those with over 500 employees, encompassing banks, insurers, publicly listed firms on European markets, and other sizable entities.

Anticipated expansions to the ambit of companies subject to ESG reporting obligations include (Brown et al. (2023); White and Case, 2023):

- By 2025: Enterprises meeting at least two of the following criteria: (i) a minimum turnover of CZK 1 billion; (ii) over 250 employees; and (iii) assets exceeding CZK 500m.
- By 2026: Small and medium-sized enterprises (SMEs) listed on stock exchanges.

The sustainability report will form an integral part of the annual report. It must include information on the company's business model and strategy, time-bound sustainability objectives, internal sustainability policies and measures, allocation of sustainability-related incentives, and actual or potential risks associated with operational activities, value and supply chains, products and services, and business relationships (Mancheva, 2023).

This report should transparently denote the temporal perspective of presented information – whether short, medium, or long-term – and adhere to European Sustainability Reporting Standards (ESRS). The strong emphasis on sustainability reporting underscores the escalating importance accorded to ESG concerns. These reporting standards aim to enhance the transparency and accountability of companies regarding their sustainability practices, aligning with the broader objectives of the European Green Deal and the Sustainable Finance Disclosure Regulation (SFDR) (Deloitte, 2023; Mancheva, 2023).

The progression of sustainability reporting in the Czech Republic mirrors broader global trends. While significant corporations actively engage in sustainability reporting, their overall proportion remains relatively small. Nevertheless, within the Czech Republic, corporate entities are actively involved in sustainability reporting, indicating a growing participation in voluntary reporting efforts. Since the late 1990s, sustainability reporting (SR) has gained significant traction in business and academia. However, its adoption remains limited within the food and agriculture sector in the Czech Republic, with scant information on recent developments.

Sustainability reporting in the Czech Republic has evolved significantly since the introduction of the NFRD and the subsequent CSRD. These directives have expanded the scope of reporting obligations to include a broader range of companies, emphasising the need for detailed disclosures on sustainability performance (European Commission, 2022). According to the CSRD, large companies, including those not previously covered by the NFRD, and listed SMEs will have to comply with these reporting standards from 2025 and 2026, respectively.

The CSRD elevates sustainability reporting to the same importance as financial reporting. Companies must provide comprehensive information on how their activities impact sustainability issues and how they affect their business operations, including detailed disclosures on environmental impacts, social responsibility, labour rights, governance practices, and anti-corruption measures (European Commission, 2022).

Horák and Fiala (2013) meanwhile analyse the adoption of Environmental, Social, and Governance (ESG) practices among Czech companies. The authors investigate the factors driving ESG adoption and the benefits associated with these practices. They find that larger companies and those with significant international exposure are more likely to adopt ESG practices. The study also identifies key barriers to ESG adoption, including lack of awareness and insufficient regulatory incentives. The authors recommend strategies for increasing the uptake of ESG practices, emphasising the role of education and regulatory support.

In the Czech Republic, sustainability reporting practices vary across industries, with significant advancements in manufacturing and finance. However, the agri-food sector, despite its critical role in sustainability, needs to catch up in terms of 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.

Šimek and Mařík (2017) provide evidence on corporate environmental responsibility (CER) initiatives among Czech companies. The authors analyse the impact of CER on business operations and performance, using data from various industries. They find that companies with strong environmental responsibility practices tend to perform better financially and enjoy higher levels of stakeholder trust. The study also highlights the role of regulatory frameworks and market incentives in promoting CER. The authors suggest that enhanced corporate environmental responsibility can lead to both environmental benefits and competitive advantages.

Sládková and Krčálová (2018) have also noted that while sustainability reporting is becoming more prevalent, many Czech companies still struggle with the quality and comprehensiveness of their reports. This gap indicates a need for further development and adherence to international reporting standards.

Kristek (2024) investigated the state of sustainability reporting among Czech companies in 2021. The claim and the starting point of the research is that lack of transparency contributes to the growing problem of corruption in different areas of society. The study reveals that Czech firms provide more information when they operate in higher risk environments (e.g. energy, financial services) or are partly or wholly state-owned. It also finds that companies participating in CSR initiatives can increase their credibility and corporate social responsibility through more public information.

The study provided by Kocmanová and Škapa (2021) investigates the factors influencing sustainability reporting among Czech companies. The authors analyse data from various industries to understand the motivations and barriers to comprehensive sustainability reporting. Their findings highlight that while regulatory requirements drive much of the reporting, there is also a significant influence from market pressures and stakeholder demands. The study provides a detailed overview of the current state of sustainability reporting in the Czech Republic and offers recommendations for improving transparency and accountability in corporate disclosures.

Motivations and Challenges in Sustainability Reporting

The motivations for adopting sustainability reporting practices are multifaceted. As Hopwood, Unerman and Fries (2010) suggest, companies are driven by ethical considerations and pragmatic benefits. These include attracting and retaining customers, gaining competitive advantages through innovation, enhancing employee satisfaction, mitigating risks, improving operational efficiencies, maintaining legitimacy, accessing capital, and boosting brand reputation.

Empirical studies indicate that companies report sustainability to meet investor expectations and regulatory requirements. Farneti and Guthrie (2009) and Higgins, Milne, and Van Gramberg (2015) explore the rationales behind sustainability reporting, emphasising the importance of transparency and stakeholder engagement. Ioannou and Serafeim (2011) demonstrate that mandatory sustainability reporting leads to more socially responsible management practices.

The transition to mandatory sustainability reporting in the Czech Republic poses significant challenges. Companies must develop robust reporting frameworks, integrate sustainability metrics into their business models, and ensure compliance with evolving regulations. The agri-food sector faces unique challenges related to environmental impacts and resource management. Nara et al. (2021) highlight the importance of indicators such as soil health, chemical usage, and stakeholder engagement in sustainability reporting for agribusinesses.

The study by Petera, Wagner, and Knorova (2016) explores how major corporations in the Czech Republic perceive and interpret sustainability. The researchers conducted a comprehensive survey to gather data on corporate sustainability practices and perceptions. Their study reveals that most large corporations in the Czech Republic acknowledge the importance of sustainability in

their operations and strategic planning. However, there is significant variation in how these corporations define and implement sustainability initiatives.

Their findings suggest that while environmental aspects of sustainability are well-recognised, social and economic dimensions often need to be emphasised more. Many corporations focus primarily on regulatory compliance rather than proactive sustainability measures. The study also highlights the influence of global sustainability trends and EU regulations on corporate strategies in the Czech Republic. Despite recognising the benefits of sustainability, corporations need more expertise, and face both financial constraints and insufficient regulatory incentives.

The authors recommend enhancing regulatory frameworks and providing more robust incentives to encourage comprehensive sustainability practices. They also recommend increasing awareness and education on the broader aspects of sustainability beyond environmental concerns. The study concludes that while progress has been made, there is a need for a more integrated approach to sustainability that encompasses environmental, social, and economic dimensions.

Štreimikienė and Šrajbmanová (2021) meanwhile analysed the sustainability reporting practices of Czech companies. They found that while there has been progress, there are still significant disparities in the quality and detail of the reports. This inconsistency can hinder the overall effectiveness of sustainability reporting as a tool for promoting transparency and accountability.

Balogh, Srivastava, and Tyll (2022) investigate the factors influencing environmental, social, and governance (ESG) disclosures among large companies in the Czech Republic. The study constructs an ESG disclosure index and analyses data from the 100 largest Czech companies to understand how firm-level factors such as revenue, number of employees, and profitability impact ESG reporting. The research finds that these factors significantly influence the level of ESG disclosures, with revenue affecting environmental and governance disclosures, and the number of employees impacting social and governance disclosures. Interestingly, the study notes that board attributes do not significantly affect ESG disclosures. This research extends the literature by providing a detailed look at ESG reporting practices in the Czech context before the adoption of the Corporate Sustainability Reporting Directive.

Sectoral Focus: The Agri-Food Industry

The agri-food industry plays a crucial role in addressing sustainability challenges due to its environmental footprint and social implications. The United Nations' Sustainable Development Goals (SDGs) emphasise the need for sustainable agriculture to combat poverty, hunger, and environmental degradation. Bebbington and Unerman (2018) discuss how agri-food companies like Unilever have integrated SDGs into their sustainability strategies. However, there needs to be more concern about the authenticity of some sustainability disclosures.

The Czech agri-food sector must enhance its sustainability reporting to meet EU standards and consumer expectations. Transparent reporting can build consumer trust and preference for socially responsible companies. However, profit-driven growth must be balanced with sustainable resource use, as scholars like Nara et al. (2021) highlight.

The Czech Republic's agri-food sector has been increasingly integrating sustainability reporting practices into its operations. This integration is driven by regulatory pressures and market demands for greater transparency and accountability in environmental, social, and governance (ESG) practices.

Key Drivers of Sustainability Reporting

Regulatory Requirements: The Czech Republic, as a member of the European Union, adheres to the EU's stringent sustainability reporting standards. These regulations mandate comprehensive disclosures on how companies manage environmental impacts, social responsibilities, and governance structures. Implementing the Non-Financial Reporting Directive (NFRD) and its upcoming successor, the Corporate Sustainability Reporting Directive (CSRD), is crucial in this context. These directives require large companies, including those in the agri-food sector, to publish detailed reports on their sustainability practices (Veselý & Havel, 2015).

Market and Stakeholder Pressures: Investors, consumers, and other stakeholders are increasingly expecting agri-food companies to demonstrate their commitment to sustainable practices. Companies that effectively communicate their sustainability efforts are more likely to gain a competitive edge, attract investment, and build consumer trust (Novotný & Poláková, 2018).

Corporate Environmental Responsibility (CER): Many Czech agri-food companies increasingly recognise CER initiatives' financial and reputational benefits. Studies have shown that companies with strong environmental policies perform better financially and enjoy higher stakeholder trust (Šimek & Mařík, 2017).

Challenges and Opportunities

Challenges: Despite progress, several challenges remain. One significant barrier is the inconsistency and variability in the quality of sustainability reports. Smaller companies, in particular, may need more resources and expertise to produce comprehensive and accurate sustainability disclosures. Additionally, there is often a lack of standardised guidelines tailored to the specific needs of the agri-food sector, which can lead to fragmented reporting practices (Zámečník & Říhová, 2019).

Opportunities: The increasing focus on green finance presents significant opportunities for the agri-food sector. Financial instruments such as green bonds and sustainable investment funds

can provide the necessary capital for implementing sustainable practices. Enhanced regulatory frameworks and market incentives can further support the growth of sustainable finance in the agri-food sector (Horák and Fiala, 2013).

The Czech Republic's agri-food sector is at a critical juncture in its journey toward sustainability. While regulatory requirements and market pressures are driving improvements in sustainability reporting, challenges remain in ensuring the quality and consistency of these reports. By addressing these challenges and leveraging opportunities in green finance, the Czech agri-food sector can enhance its sustainability practices, thereby contributing to broader environmental and social goals.

Conclusion

Green finance and sustainability reporting are crucial to the EU's strategy to achieve a carbon-neutral economy by 2050. The Czech Republic, in alignment with EU directives, is progressively enhancing its regulatory framework to promote transparency and accountability in sustainability practices. The CSRD significantly broadens the scope of sustainability reporting, compelling companies to provide detailed disclosures on their ESG impacts.

While the Czech Republic has made strides in sustainability reporting, the agri-food sector requires further development to align fully with EU standards. Addressing the challenges and leveraging the opportunities in sustainability reporting will be essential for Czech companies to remain competitive and contribute to broader environmental and social goals. This literature review underscores the importance of regulatory compliance, stakeholder engagement, and transparent reporting in driving sustainable business practices in the Czech Republic.

4.1. FINANCIAL RELEVANCE OF THE SAMPLE

The subchapter is structured to introduce and analyse financial data, focusing on selected companies in the Czech food, beverages, and tobacco industry for 2022, with a detailed breakdown of financial indicators across subsectors. It systematically explores financial concentration, highlighting key subsectors where selected companies hold significant shares, and concludes with data sources and visual aids supporting the analysis.

The number of investigated Czech firms represented less than 0.6 percent of the total number of corporates in the sector in 2021-2022 interval, focusing on the financial year of 2022.

Table 11

Main financial data and shares of the selected companies relative to the subsectors and to the whole sector (2022) in Czech Republic

Subsectors (NACE)	Number of companies	Number of selected firms	Share of revenue	Share of net profit	Share of total assets	Share of equity
Processing and preserving of meat and production of meat products (10.1)	1,742	5	27%	16%	27%	29%
Processing and preserving of fish, crustaceans and molluscs (10.2)	19	0	-	-	-	-
Processing and preserving of fruit and vegetables (10.3)	161	1	49%	66%	46%	42%
Manufacture of vegetable and animal oils and fats (10.4)	22	3	78%	81%	97%	99%
Manufacture of dairy products (10.5)	201	10	70%	69%	70%	76%
Manufacture of grain mill products, starches and starch products (10.6)	220	1	15%	16%	22%	26%
Manufacture of bakery and farinaceous products (10.7)	4,457	8	70%	69%	75%	79%
Manufacture of other food products (10.8)	2,617	17	78%	74%	80%	82%
Manufacture of prepared animal feeds (10.9)	451	10	79%	67%	86%	83%
Manufacture of beverages (11.0)	3,137	13	79%	76%	78%	82%
Manufacture of tobacco products (12.0)	12	1	99%	79%	99%	99%
Total (selected companies / whole sector)	**13,039**	**69**	**68%**	**71%**	**73%**	**76%**

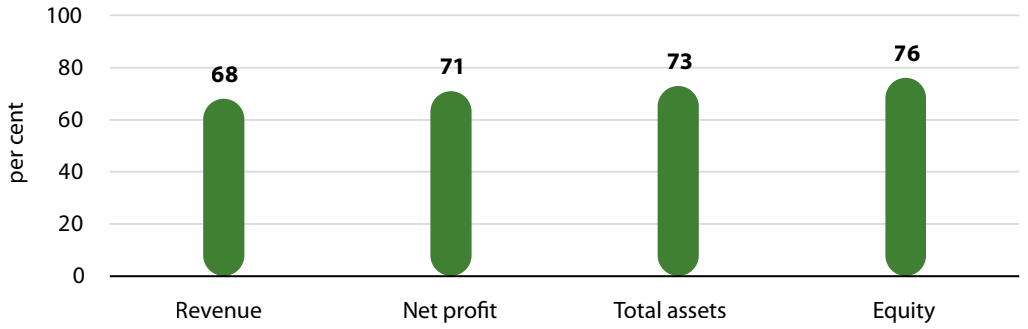
Note: private enterprises are also included in the whole number of companies in food, beverages and tobacco industries
Source: Authors' own calculation based on the data derived from the purchased database: www.ceginformacio.hu, www.crefoport.hu, and using database of https://ec.europa.eu/eurostat/databrowser/view/sbs_ovw_act__custom_15475826/default/table?lang=en

The data table presents an overview of the financial performance of selected companies within various subsectors of the Czech food, beverages and tobacco industry in 2022. The table highlights the share of revenue, net profit (profit before tax), total assets and equity held by these selected companies relative to the total number of firms within each subsector and the entire food, beverages and tobacco sector. The data is sourced from Céginfomáció.hu Kft, indicating a compilation of financial information specific to Czech located companies.

The ratio of total net revenue exceeded 60% in 2022, while the ratios of net profit, total assets and equity were each higher than 70% (Table 11). Consequently, the ratios also reflected the strong financial concentration in the sector as a whole regarding the financial year of 2022 (Figure 5).

Figure 5

Share of the main financial characteristics of the selected Czech companies in relation to the whole national food processing sector (2022)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

Of the 11 subsectors listed in the Czech Republic's food, beverages and tobacco industry, 5 subsectors had a **share of revenue** from the selected companies of over 60%. These are (Table 11):

- Manufacture of vegetable and animal oils and fats (10.4): 78%
- Manufacture of other food products (10.8): 78%
- Manufacture of prepared animal feeds (10.9): 79%
- Manufacture of beverages (11.0): 79%
- Manufacture of tobacco products (12.0): 99%.

It is worth noting that the number of selected firms varies significantly across these subsectors, ranging from 1 to 17 companies. This means that the share of revenue figures may not be directly comparable across all subsectors.

In the Czech Republic's food, beverages and tobacco industry, there are 4 subsectors where the selected companies had a **share of net profit** exceeding 70%:

- Manufacture of vegetable and animal oils and fats (10.4): 81%
- Manufacture of other food products (10.8): 74%
- Manufacture of beverages (11.0): 76%
- Manufacture of tobacco products (12.0): 79%.

It's important to note that the number of companies chosen for analysis within these subsectors varies, ranging from 1 to 17 companies. Consequently, direct comparisons of profit share figures across all subsectors may not be entirely accurate.

The share of total assets held by the selected companies in the food manufacturing sector in the Czech Republic is 73%. This figure represents the proportion of assets owned by the 69 companies analysed in the study compared to the total assets of the entire food manufacturing sector in the Czech Republic.

In the Czech Republic's food, beverages and tobacco industry, there are 6 subsectors where the selected companies had a **share of total assets** exceeding 70%. These are (Table 11):

- Manufacture of vegetable and animal oils and fats (10.4): 97%
- Manufacture of bakery and farinaceous products (10.7): 75%
- Manufacture of other food products (10.8): 80%
- Manufacture of prepared animal feeds (10.9): 86%
- Manufacture of beverages (11.0): 78%
- Manufacture of tobacco products (12.0): 99%.

Regarding the **share of equity**, the following 7 subsectors were outstanding:

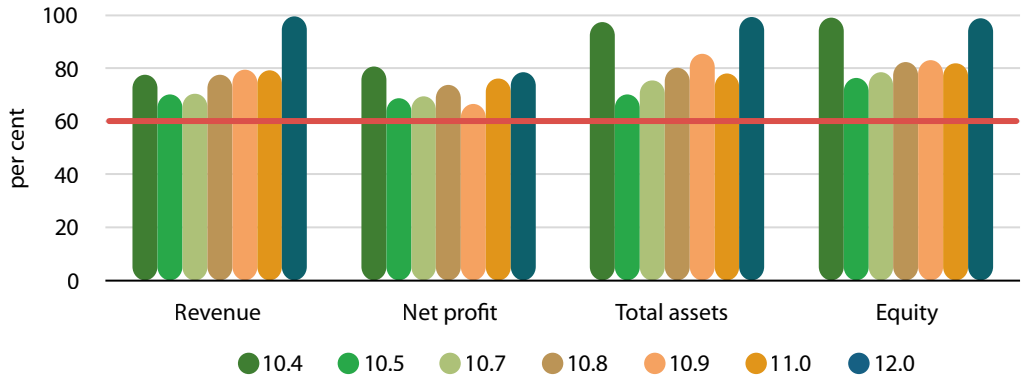
- Manufacture of vegetable and animal oils and fats (10.4): 99%
- Manufacture of dairy products (10.5): 76%
- Manufacture of bakery and farinaceous products (10.7): 79%
- Manufacture of other food products (10.8): 82%
- Manufacture of prepared animal feeds (10.9): 83%
- Manufacture of beverages (11.0): 82%
- Manufacture of tobacco products (12.0): 99%.

The largest subsector of food manufacturing in the Czech Republic, based on the number of selected companies, is 'Manufacture of other food products (10.8)' with 17 companies included in the analysis. At the same time, the share of selected corporates was the highest in 'Manufacture of vegetable and animal oils and fats (10.4)' at 13.6% (3 / 22 firms).

Moreover, the shares of selected corporates were higher than 1.0 percent in additional 3 subsectors: 'Manufacture of tobacco products (12.0)': 8.3% (1 / 12 corporations), 'Manufacture of dairy products (10.5)': 5.0% (10 / 201 companies) and 'Manufacture of prepared animal feeds (10.9)': 2.2% (10 / 405 corporates) (Table 11).

Figure 6

Outstanding subsectors in Czech Republic (2022)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

In terms of financial concentration, those subsectors were considered highly significant in this research where all main financial parameters exceeded 60%. In the Czech Republic the following 7 subsectors were outstandingly remarkable based on all investigated main financial data of 2022 (Figure 6):

Manufacture of food products (10.0) – a total of 48 firms

- Manufacture of vegetable and animal oils and fats (10.4) – 3 firms
- Manufacture of dairy products (10.5) – 10 firms
- Manufacture of bakery and farinaceous products (10.7) – 8 firms
- Manufacture of other food products (10.8) – 17 firms
- Manufacture of prepared animal feeds (10.9) – 10 firms

Manufacture of beverages (11.0) – 13 firms

Manufacture of tobacco products (12.0) – 1 firm

Financial concentration in the Czech food, beverages, and tobacco industry is notably high, with selected companies holding significant shares of revenue, net profit, total assets, and equity across various subsectors. Key subsectors contributing to this concentration include the manufacture of vegetable and animal oils and fats, dairy products, bakery and farinaceous products, other food products, prepared animal feeds, beverages, and tobacco products, all of which exhibit substantial financial influence within the sector.

4.3. RESULTS

The subchapter analyses the types of sustainability reports in the Czech Republic's food, beverages, and tobacco sector, categorising them based on their depth and availability. In addition, it presents a content analysis of these reports using relative scores, evaluating corporate sustainability efforts across various EU taxonomy objectives, including climate change mitigation, biodiversity protection, water resource management, and the transition to a circular economy, highlighting key priorities and gaps in each area.

4.3.1. Types of sustainability reports investigated

In the Czech Republic, 69 companies were analysed, of which **21** companies had created online available sustainability report or published detailed numerical information about environmental activities on their website.

Individual reports differed in the form of processing. Specifically, the following types of sustainability reports were observed:

- Detailed sustainability report (15 companies)
- Simplified sustainability report (3 companies)
- Other environmental document (1 company)
- Detailed website with figures (2 companies)

Following subsectors were identified concerning those 21 companies had online sustainability reports compared to the number of companies in the financial sample (Table 12):

Table 12

Main subsectors in Czech sustainability sample compared to the financial sample (2022)

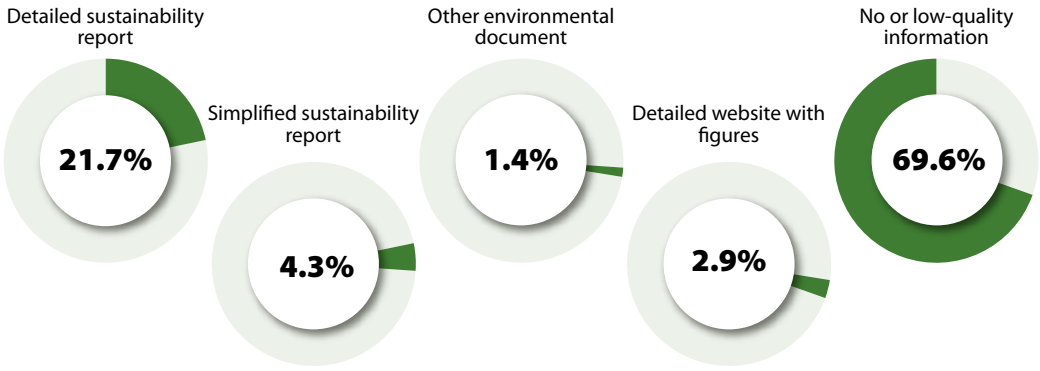
Subsectors (NACE)	Number of companies in sustainability sample	Number of companies in financial sample	Share of companies (%)
Manufacture of vegetable and animal oils and fats (10.4)	3	3	100
Manufacture of other food products (10.8)	12	17	71
Manufacture of beverages (11.0)	5	13	38
Manufacture of tobacco products (12.0)	1	1	100

Note: share of companies was calculated as follows: number of companies in sustainability sample divided by number of companies in financial sample *100
Source: Authors' own calculation

These are the total number of corporates in case where content analyses of sustainability information were done.

Figure 7

Sustainability Reporting Practice in the Czech Republic´s Food, Beverages and Tobacco Sector in the investigated period (2021-2023)



Source: authors' compilation

The Figure shows the distribution of sustainability reporting practices among 69 companies in the financial sample of Czech Republic's food, beverages and tobacco sector (Figure 7).

- **No Specific Report**: Most companies (69.6 percent) do not publish any specific sustainability report.
- **Detailed Sustainability Report**: 21.7 percent of companies (15) produced a comprehensive sustainability report, the highest percentage among those that engage in some form of reporting. All were 'Global' companies' reports, i.e. – as we mentioned earlier in methodology chapter – in the case of the Czech subsidiary we assessed the sustainability report prepared by the parent company. 8 reports were mandatory in line with NFRD (for the reason of 7 'Global' parent companies published detailed reports are listed and 1 company with domestic ownership is also listed company). The other detailed reports were voluntary.
- **Simplified Sustainability Report**: 4.3 percent of companies (3) issued a basic sustainability report with limited information. These shorter but environmentally comprehensive documents were issued by 'Global' companies as well.
- **Other Environmental Documents**: Only one company (an independent company from 10.8 subsector) issued a 4 pages long alternative environmental document.
- **Detailed Website with Figures**: 2.9 percent of companies (2) disclosed sustainability-related data on a dedicated website with detailed figures.

This breakdown indicates that while some companies (mainly foreign-owned 'Global' parent companies with detailed and simplified reports) take steps to communicate their sustainability efforts, the majority still need development regarding preparation of formal sustainability reports.

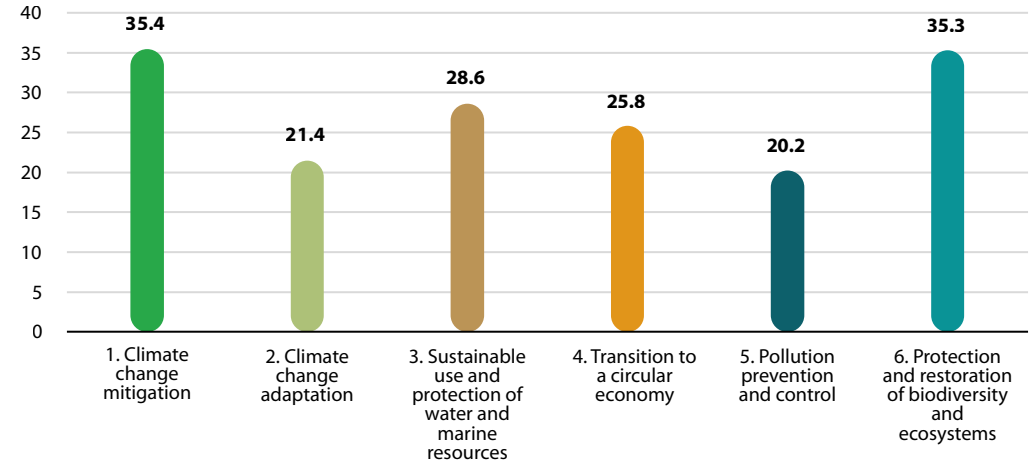
4.3.2. Content analysis of the sustainability reports using relative scores

For 21 companies, the fulfilment of taxonomic objectives was investigated. Overall, the highest relative score was Climate change mitigation (35.4), followed by Protection and restoration of biodiversity and ecosystems (35.3) with almost the same score, then Sustainable use and protection of water and marine resources (28.6), and Transition to a circular economy (25.8). Conversely, the objectives Pollution prevention and control (20.2) and Climate change adaptation (21.4) have the lowest relative scores (Figure 8).

Of the activities leading to the fulfilment of the Climate change mitigation objective, so-called '**generating, transmitting, storing, distributing or using renewable energy' in line with Directive (EU) 2018/2001, including through using innovative technology with a potential for significant future savings' has the highest relative score (50.8). Furthermore, the additional plus aspect added during the research, called 'Greenhouse gas emissions (GHG)', had an extremely high relative score (77.8),** and reducing GHG is also a top priority, underscoring the importance of emission control in sustainability efforts (Figure 9).

Figure 8

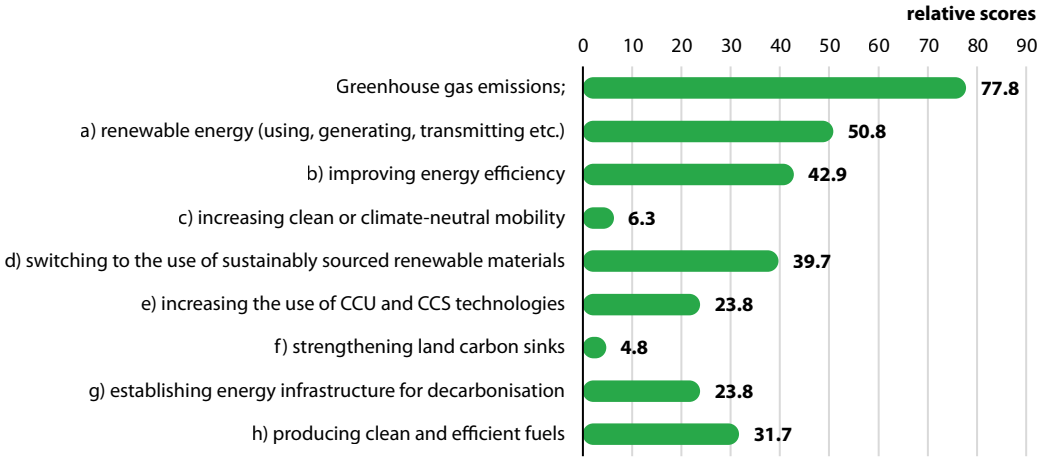
Relative scores by EU taxonomy objectives in Czech Republic



Source: own compilation of the authors

Figure 9

Relative scores of the activities of the climate change mitigation objective



Source: own compilation of the authors

The graph presents relative scores for various sustainability and energy transition activities, measuring their importance or prevalence based on assigned scores (Figure 9).

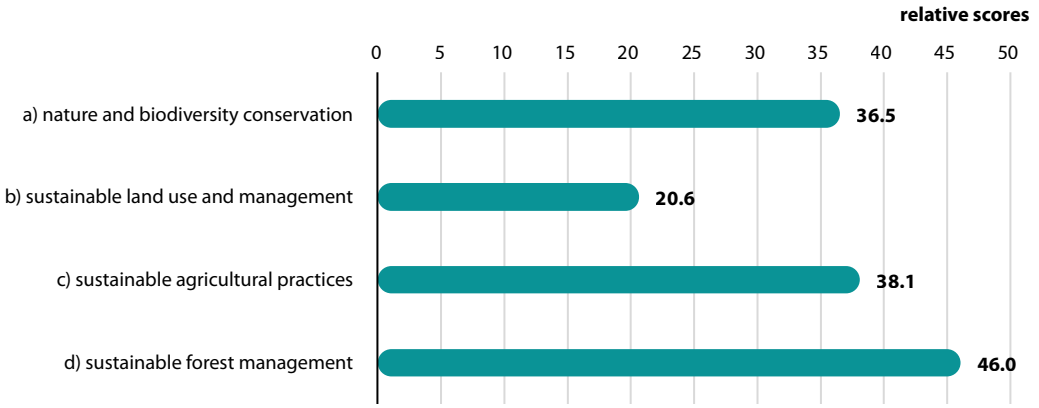
The relative scoring of 'Improving energy efficiency' (42.9) is crucial, suggesting that efforts to minimise energy waste and optimise energy use are highly significant. 'Switching to sustainably sourced renewable energy' relative score (39.7) meanwhile reflects a significant focus on adopting renewable energy sources from sustainable origins. 'Producing clean and efficient fuels' at (31.7) is another important area that aims to reduce environmental impact.

'Increasing the use of CCU and CCS technologies' with a score of (23.8) indicates relatively lower interest in technologies for Carbon Capture and Utilisation (CCU) and Carbon Capture and Storage (CCS) as part of carbon management strategies. Similarly, 'Establishing energy infrastructure for decarbonisation' with the same (23.8) relative score, indicates a less focus on building the infrastructure needed to support lower-carbon energy systems.

The graph suggests that while all these areas contribute to sustainability and decarbonisation efforts, renewable energy, emission reductions, and fuel efficiency are the most emphasised components. Conversely, natural carbon sinks are less prioritised in this context.

Figure 10

The relative scores of the activities of the protection and restoration of biodiversity and ecosytem objective



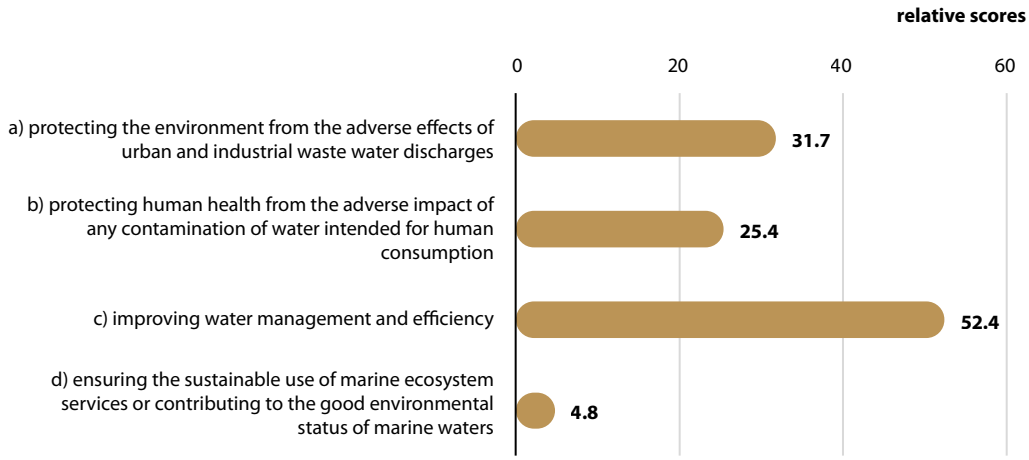
Source: own compilation of the authors

The chart provides relative scores for four critical biodiversity and ecosystem protection activities (Figure 10). **'Sustainable forest management**' has the highest relative score (46.0), indicating that sustainable forest management is the most prioritised or heavily invested activity among the four. It suggests a strong emphasis on practices that maintain or enhance forest ecosystems. 'Sustainable agricultural practices' ranking second (38.1), also receives considerable attention. This score reflects the importance of agricultural methods that protect biodiversity and minimise environmental impact. 'Nature and biodiversity conservation' has a moderate score (36.5), showing that conservation efforts are present but less prioritised than forestry and agriculture. With the lowest relative score, 'Sustainable land use and management' (20.6) appears less emphasised in biodiversity and ecosystem protection efforts.

The data suggests a strong focus on forest management and agricultural practices, while land use and broader conservation efforts may need to be developed or receive fewer resources. This distribution reflects how different biodiversity goals were prioritised in this taxonomy context in the Czech Republic between 2021 and 2023.

Figure 11

Relative scores of the activities of the sustainable use and protection of water and marine resources objective



Source: own compilation of the authors

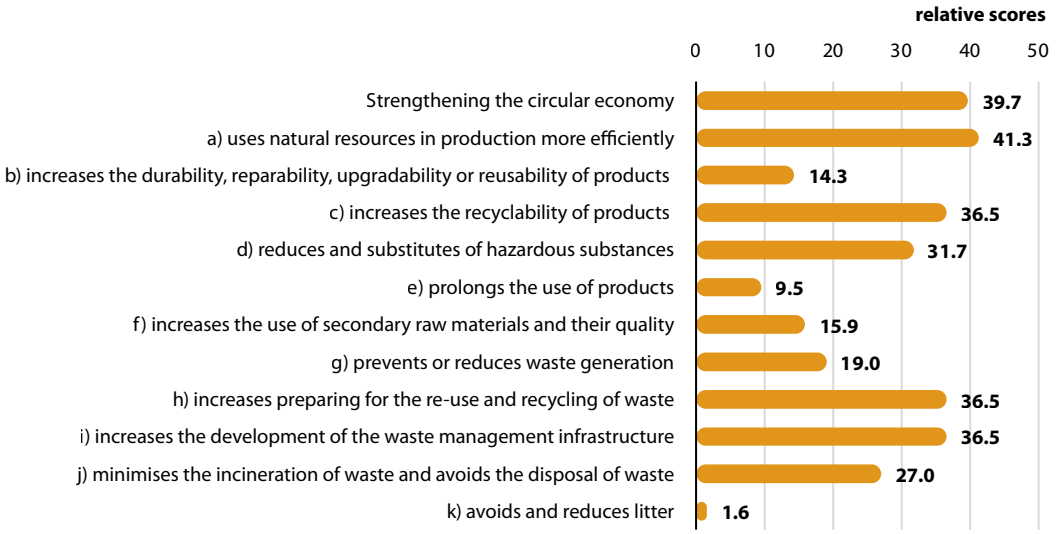
The chart displays the relative importance or frequency of various water and marine resource protection activities (Figure 11). '**Improving water management and efficiency**' has the highest score (52.4), indicating that this activity can be considered as the most important area of sustainable use and protection of water from the perspective of this research. 'Protecting the environment from wastewater discharges' (31.7) focuses on minimising the environmental impact of wastewater from urban and industrial sources and is also relatively highly assessed. 'Protecting human health from contamination of water' (25.4) plays a moderate role in investigated sustainability reports, while 'Sustainable use of marine ecosystem services' (4.8) has the lowest score, indicating a limited focus on marine resource sustainability compared to other water-related objectives. This is natural, as it is mainly the 'Global' parent companies that are concerned with the protection of the marine ecosystem, hence in the Czech Republic this is not a relevant area.

In summary, the chart strongly focuses on effective water management and consumption of water. Furthermore, wastewater treatment is also a highlighted activity, while human health protection in the context of water resources and efforts to protect marine ecosystems are less emphasised. This distribution of scores reveals priorities in corporate water management, with efficient water use taking precedence.

The Figure presents a breakdown of various activities related to strengthening the circular economy alongside their respective relative scores, reflecting each activity's perceived importance or performance. The activities listed are all related to sustainable practices that reduce environmental impact, conserve resources, and promote a circular economy (Figure 12).

Figure 12

The relative scores of the activities of the transition to a circular economy objective



Source: own compilation of the authors

Arbitrary plus notation used in the research, namely the **'Strengthening the circular economy (CE)'** relative score likely represents the overall emphasis placed on enhancing circular economy practices. The second highest relative score of 39.7 recorded here suggests that circular economy improvement is important, but there are also other specific activities that are similarly prioritised in terms of impact or progress. **'Using natural resources more efficiently in production'** (41.3) shows a most significant focus, indicating a strong emphasis on improving resource efficiency in production processes. Efficient use of natural resources reduces environmental pressure and supports the foundational goals of the circular economy.

'Increase in the recyclability of products' (36.5) with a relatively high score indicates that this activity is a critical focus, reflecting the importance of designing products for easy recycling. Recycling is vital in circular economies, as it ensures that materials stay used longer and reduces the demand for new raw materials.

The same relative scores were achieved by two other activities, both related to waste management. 'Increases in preparing for the reuse and recycling of waste' (36.5) are prioritised and implies a robust emphasis on ensuring that products and materials are ready for reuse or recycling, which is critical for maintaining closed-loop systems in a circular economy. 'Increasing the development of waste management infrastructure' (36.5) is crucial for facilitating recycling and waste reduction, and this score reflects the fact that more effective and developed waste management systems play an important role in supporting circular economy goals.

The following two activities are also worth mentioning: 'Reduces and substitutes of hazardous substances' (31.7) and 'Minimising waste incineration and avoiding waste disposal (27.0). These topic areas suggest a moderate focus on minimising incineration and landfilling, activities which are generally viewed as less sustainable. There is a clear recognition of the need to move away from waste disposal methods that do not contribute to material recovery.

In summary, the data exhibits a strong prioritisation of the circular economy as a whole, particularly focusing on activities using natural resources in production, improving recyclability, reusing and reducing of waste, and enhancing the infrastructure and processes for managing waste. Activities aimed at reducing harmful substances and avoiding waste disposal are also considered necessary. However, prolonging the use of products and increasing the use of secondary raw materials are lower priorities in this context.

In conclusion, the most relevant EU taxonomy objectives in the Czech analysis are Climate change mitigation (35.4) and Protection and restoration of biodiversity and ecosystems (35.3), followed by Sustainable use and protection of water and marine resources (28.6) and Transition to a circular economy (25.8).

Among the activities, 'Greenhouse gas emission (GHG)' (77.8) and 'generating, transmitting, storing, distributing, or using renewable energy' (50.8) stand out in terms of Climate change mitigation objective, whereas 'sustainable forest management' (46.0) and 'sustainable agricultural practices' (38.1) lead in terms of Biodiversity protection objective. 'Improving water management and efficiency' activity (52.4) is the most relevant to Sustainable use of water objective. For circular economy efforts, 'using natural resources more efficiently in production' (41.3) and 'Strengthening the circular economy (CE)' (39.7) are the top priorities.

'Global' food and beverage companies play a crucial role in ESG reporting, as they face increasing pressure from consumers, regulators, and shareholders to adopt sustainable practices. These companies are implementing ESG initiatives to enhance their brand reputation and comply with evolving regulatory landscapes, driven by factors such as consumer demand and competitive pressures (Jacobsen, 2023; bccResearch, 2023). However, challenges persist, including the complexity of global supply chains and the need for clearer guidelines on sustainable practices (Bradley, 2023). Despite these hurdles, major corporations like Coca-Cola or Nestlé are setting ESG objectives and investing in sustainability projects, demonstrating the industry's commitment to environmental and social responsibility The impact of ESG reporting on global food and beverage companies is multifaceted, influencing their operational strategies, supply chain management, and overall market positioning. By prioritising ESG, these companies can mitigate risks, enhance their reputation, and capitalise on emerging trends in sustainability (Haywood and Fogel, 2022).

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5. HUNGARY

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This chapter summarises the results of three main themes of our V4 research in case of Hungary.

In the first subchapter, a literature review – regarding green finance, regulatory and institutional background, sustainability and ESG-related higher education programmes and research centres, moreover, Hungarian sustainability reporting practices – is presented. After that, the financial concentration of the analysed industry is demonstrated. In the third subchapter, detailed relative scoring results of the content analysis of sustainability sample are presented for Hungary in terms of taxonomy objectives and activities.

5.1. LITERATURE REVIEW

Introduction

Member States had until July 2024 to transpose the EU's Sustainability Reporting Directive into national law. The implementation of the CSRD Directive into national law was achieved through the amendment of the Accounting Act (Act C, 2000) and the ESG Act (Act CVIII, 2023), which was adopted in 2023 and entered into force in 2024. However, the fulfilment of reporting obligations and the achievement of a sustainable transition impose a number of challenges on Hungarian companies. Steps have therefore also been taken at a national level to facilitate and support this process.

The process of legal implementation in Hungary was preceded by the strategic role of the Central Bank of Hungary (in Hungarian: Magyar Nemzeti Bank, MNB) and its active leadership in the creation of the Hungarian green financial system.

Green finance in Hungary

The green transition described in Chapter 1 – including the NFRD-CSRD transition, EU taxonomy and other relevant regulations – affects the financial sector as a whole. All the actors of the financial sector need to transform its internal processes, products and services to meet the challenges facing its customers and to maintain its own viability.

The key challenges are the managing uncertainty, ensuring prudent climate policies, collecting data to measure climate risk and establishing a methodology. It can be stated that, as regulations deepen, uncertainty is diminishing, and the green and brown economies are becoming more separable. Furthermore, more data is becoming available each year under the disclosure requirements, and their credibility is improving. As regulations are converging, methodologies are also converging. However, a further challenge is that over-regulation can act as a disincentive to the green transition, even to the detriment of global competitiveness (MNB, 2021a).

Like many other central banks, the Central Bank of Hungary (MNB) has set a strategic goal for the domestic financial intermediary system to promote environmental sustainability as strongly as possible through its financial products and services.

After the mandatory EU legal harmonisation, the first steps towards green financing in Hungary were taken by the MNB. The MNB launched its Green Programme, in February 2019 (MNB, 2019). The central bank of Hungary aims to mitigate ecological, economic and financial risks, develop the domestic capital market for green purposes, and improve the financing environment for green investments. This includes creating favourable rules for green investment products, providing more accurate, transparent and reliable information of environmental risks and benefits. Moreover, the MNB supports the achievement of positive environmental and sustainability impacts.

The MNB was the first in the CEE region to include a commitment to the green transition among its tasks (Act CXXXIX, 2013, 3. § (2)).[9] The Central Bank of Hungary published its annual series of studies, the Green Finance Reports (GFR, 2021, 2022, 2023, 2024), followed by the Green Recommendation (MNB, 2021b) and the official green finance website.

At the same time the Budapest Stock Exchange (BSE) published its ESG Guide (2020). The largest commercial bank (OTP) and the official export credit agency (EXIM) have also formulated their green loan framework (GLF, 2023) and sustainable finance framework (EGFF, 2022) and these are being continuously improved (SFF, 2024; EGFF, 2024).

The foundations of the green financial system were laid in parallel with the EU legislative harmonisation process. The most important elements of this process are summarised in Table 13, and the following subchapter will discuss in more detail the key harmonisation steps and the development of the Hungarian sustainability institutional framework.

9 Act CXXXIX (2013), 3.§ (2), which was legally effective from 2 August 2021: "Without prejudice to its primary objective, the NBH shall support the maintenance of the stability of the system of financial intermediation, the enhancement of its resilience, its sustainable contribution to economic growth; furthermore, the NBH shall support the government's economic policy and its policy related to environmental sustainability, using instruments at its disposal."

Table 13

Main elements of the Hungarian legislative background to sustainability and green finance (in chronological order)

Time of application	Name of Legislation	Topic	Target group
from 2016	Act C of 2000 on Accounting	NFRD / CSRD	non-financial companies
from 2020	Act XLIV of 2020 on Climate Protection	ESG	non-financial companies, financial market actors, all economic agents
from 2020	BSE ESG Guide	ESG	non-financial companies, financial market actors
from 2021	MNB Regulation No 20/2021 (23.VI.)	maturity mismatch of redit institutions in HUF	financial market actors
from 2024 (in stages)	Act CVIII of 2023 (ESG Act)	NFRD / CSRD	non-financial companies, financial market actors, all economic agents

Source: Authors' own compilation on the basis of https://www.mnb.hu/greenfinance/zold-jogtar

The regulatory and institutional background in Hungary

In Hungary there are four main organisations involved in the translation of EU legislation into Hungarian law, the development of Hungarian legislation and the promotion of sustainable transition. The Ministry of National Economy (in Hungarian: Nemzetgazdasági Minisztérium, NGM) is responsible for the development of ESG regulation and the professional management of ESG regulation. The Regulatory Authority for Regulated Activities (in Hungarian: Szabályozott Tevékenységek Felügyeleti Hatósága, SZTFH) is responsible for the administrative implementation of ESG regulation. Its tasks include setting out the due diligence obligations of companies for sustainability purposes, minimum reporting requirements and disclosure rules. The Hungarian Agency for Economic Development (in Hungarian: Gazdaságfejlesztési Ügynökség, GFÜ) is responsible for ESG sustainability training for enterprises, development support programmes, ESG awareness-raising and advisory services, and ESG advisory training. In order to develop a system for businesses that best reflects Hungarian specificities in meeting EU obligations, the ESG Council, chaired by the Minister of National Economy, has been established. The Central Bank of Hungary (in Hungarian: Magyar Nemzeti Bank, MNB) is responsible for encouraging and monitoring the financial sector, insurers and other financial service providers to follow the relevant reporting and sustainability standards and providing guidance in line with the ESG criteria (Fehér, 2024).

In 2019, the National Bank of Hungary adopted its Green Programme, which aims to mitigate ecological, economic and financial risks, to develop the domestic capital market towards green goals, to enhance the financing environment for sustainable investments and thereby to stimulate the domestic financial intermediary system to promote environmental sustainability through its financial products and services to a much greater extent than at present. In 2021, the MNB became one of the first in Europe to receive a sustainability mandate from the Parliament: "The

MNB supports the Government's economic and environmental sustainability policies with the tools at its disposal, without compromising its primary objective (price stability)." (Kolozsi, 2024). The green capital requirement discounts were introduced in 2021 as part of the MNB's Green Programme, for green activities in sustainable agriculture, electromobility, energy efficiency and real estate. The aim of the green capital requirement discount is to increase the share of environmentally sustainable (green) industries and customers in banks' balance sheets, compared to "brown" industries and customers, i.e. those more exposed to stricter environmental regulation (and therefore riskier in the longer term). In addition, the Green Recommendations will help financial institutions to operate more sustainably and resiliently in the areas of risk management, product development, responsible banking policies, corporate governance, carbon footprint reduction and reporting (Kolozsi, 2024).

The CSRD Regulation was introduced into Hungarian law as an amendment to Act LXXV of 2007 on Accounting. Besides, Act CVIII of 2023, the "ESG Act", was published on 22 December 2023, which obliges companies to conduct and regularly document ESG due diligence in their supply chains in accordance with the CSRD Regulation. However, in order to achieve the EU sustainability goals, a consistent and transparent methodology to support the transition is needed.

The purpose of Regulation 13/2024 (VIII.15) on the detailed rules for the fulfilment of due diligence obligations of companies for sustainability purposes is to define, on the basis of the ESG Act, the detailed rules that allow for an objective comparison of companies according to sustainability criteria and the monitoring of their responsibility. In order to assist the corporate sector in complying with ESG criteria, the SZTFH has created an ESG questionnaire, which is annexed to Regulation 13/2024 (SZTFH, 2024).

The questionnaire contains a set of questions in a table format, which form the basis for ESG reporting and supply chain due diligence, as companies are also required to collect data from their direct suppliers. The table consists of a comprehensive set of questions, with each question categorised under the themes of environmental, social and corporate governance. The screening of direct suppliers is supported by § 4 (10) of the 13/2024 (VIII.15.) Regulation (SZTFH, 2024), which lists the questions to be answered according to the size and geographical location of the suppliers (SZTFH questionnaire, 2024).

According to the MNB's recommendation, lending financial institutions must assess the ESG risks of companies applying for a loan before granting a loan. The supervisory requirement will apply from July 2025 to corporate lending above HUF 500 million, and gradually to lower contract amounts in the following years**.** To support banks and financial firms in assessing ESG risks, the MNB has also developed a set of standardised questionnaire recommendation for banks (MNB, 2024).

Sustainability and ESG-related higher education programmes and research centres in Hungary

Research workshops related to ESG (Environmental, Social, Governance) research are already operating in several places in Hungary, where, in addition to the dissemination of ESG research, in-depth studies of the topic are also being carried out.

The doctoral programmes at Corvinus University of Budapest deal with ESG-related topics, particularly in the field of finance. ESG research aims to measure and quantify non-financial factors such as climate risks, vulnerability of supply chains, and communication with employees and customers. The university also organises conferences to discuss current ESG issues and operates the Sustainability Indicators Research Centre. The Institute for Climate Policy of Mathias Corvinus Collegium prepares professional conferences and analyses on ESG. The Oeconomus Economic Research Foundation organised a conference on ESG in June 2024, where the Hungarian ESG law and its practical implications were examined. ESG HUB can meanwhile help stakeholders navigate the sustainability maze, with a knowledge base and good practices. Pensum Group and DTC Solution conducted a joint national survey of decision-makers in 2024 on ESG awareness and practices in Hungary. And the 2022 survey "Where are Hungarian companies in ESG adoption?" by Effekteam and Comlab-ESG Core Group provided a comprehensive picture of the ESG readiness of Hungarian companies (Effekteam, 2022).

In Hungary, there are also several ESG training and education courses available to enhance the knowledge in the fields of sustainability, social responsibility and corporate governance. These programmes are available at different levels and in different formats, including online and face-to-face training. The training courses are aimed at corporate managers, finance professionals, consultants and anyone who wants to gain a deeper understanding of ESG. The duration and cost of programmes can vary. Here are some important examples of universities and specialised training courses:

- Széchenyi István University (Győr): ESG Environmental-Social-Governance Specialist Advanced Training.
- Corvinus University of Budapest: Accredited ESG Consultant sub-training, ESG Management, ESG Specialist Economist.
- Budapest Metropolitan University (Budapest): ESG Consultant partial knowledge training.
- University of Pécs: accredited ESG consultant
- Debrecen University: accredited ESG consultant.
- SGS Academy offer various ESG training solutions from introductory level to subject-specific levels. Meanwhile, ESG Alliance offer a variety of ESG and sustainability compliance training courses.

Finally, it is important to emphasise the highest quality ESG research centres in Hungary, operated by universities, research institutes and the MNB. The lists and websites of the most prominent ESG research centres in Hungary are:[10]

- Corvinus University: Sustainable Finance Research Centre
- Debrecen University: Biodiversity, Water Management and Climate Change Competence Centre
- University of Pécs: Sustainability Centre (CAL/ESG)
- University of Szeged: SZTE Greennovation Centre
- Central Bank of Hungary: Sustainable Finance Centre
- Hungarian Research Network (HUN-REN): Sustainability Centres.

Sustainability reporting practices in Hungary

Corporate social responsibility is a relatively recent phenomenon that emerged in Hungary in the 2010s. Karcagi-Kováts (2012) analysed performance indicators based on a detailed review of 70 CSR/sustainability reports published in Hungary over 9 years.

Designing indicators and reporting on sustainability is a learning process. The 51 Hungarian companies that were assessed are in various stages of this evolution. Most reporting companies employ GRI's G3 as a reporting standard and guideline; the most popular application level is B/B+. They also construct their indicator systems according to this guidance. The 2012 study discovered that the number of different indicators is generally much higher than the theoretically or intuitively given 30–45, even though the vast majority of published studies on sustainable development indicators emphasise that a relatively small number of indicators is preferable in sustainability reports. Although their inclusion should be beneficial, the ecological approach, its principles, and the associated indicators are entirely missing from Hungarian companies' sustainability reports. A number of studied reports nonetheless include eco-efficiency indicators.

Kozma and Bosnyák-Simon (2021) 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: 1. Companies that produce sustainability reports; 2. Companies that publish an annual energy report; 3. Companies 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 what the most pressing issues are. Their research found that there are a number of co-existing mandatory and voluntary disclosure requirements that require different disclosures and are therefore only partially suitable for comparing companies' sustainability performance. Moreover, a number of companies reports only address ESG issues at a basic level and

10 See Annex 2 for more details.

only a minority report on concrete actions and achievements. It is therefore considered important to take steps to promote the comparability of companies on the basis of ESG indicators.

Lippai-Makra *et al.* (2022) analysed the non-financial reporting practices of Hungarian-listed public limited companies in the interval 2016-2018, based on NFRD. The authors set four levels to categorise the quality of disclosure 0 = no disclosure; 1-30% = low quality disclosure; 31-70% = medium quality disclosure; 70-100% = high quality disclosure. The study found that the reporting format of companies (using standards e.g. GRI, or their own format) is mixed. The results show that the overall reporting quality of the Hungarian sample is low, with an overall index value of 29.03 in 2016. This rises only slightly above the mid-point in 2017 and 2018 (to 32.76 and 33.06 respectively). The study found that companies scored highest for information disclosed in the category of environmental issues. The results show that the NFRD had a greater impact on companies that did not voluntarily report non-financial information before the legislation was introduced, and on those that were not previously regulated.

In their concept paper, Kovács and Lippai-Makra (2023) provide an overview of the difficulties associated with intangible capital and non-financial reporting and make suggestions to help prepare for compliance. They argue that future research should analyse which topics companies report on and in what detail, as these two dimensions affect the quality of the information provided to stakeholders. With the entry into force of ESG disclosure standards, attention and focus will shift to the quality of the information supplied. Companies that commit to disclosing high-quality information beyond mandatory disclosure will stand out as best practices. The accuracy of information will be of equal importance when assessing non-financial reports.

Gombkötő *et al.* (2023) analysed the sustainability reporting practices of agricultural and forestry companies for 2021. Of the 26 enterprises surveyed, three agricultural enterprises did not provide any information on sustainability. In the case of agricultural companies, sustainability efforts are most often expressed indirectly or in other content. Of all the companies surveyed, only one – a forestry company – has a detailed sustainability report. In addition to the mandatory reports, ISO standards, good manufacturing and hygiene practices and quality policy objectives are also used to present information on sustainability efforts.

Our current research in the V4 countries was based on a survey conducted by Lámfalusi *et al.* (2024), which examined the sustainability reporting of 82 large Hungarian food companies. Out of the 82 companies, a total of 52 had some kind of sustainability-related information published on their website. According to the NFRD regulations in force at the time of this paper, Hungarian food processing companies were not obliged to prepare non-financial reports. Out of the 52 food processors that participated in the survey, 31% of the sustainability reports were determined to be standalone documents with full information (detailed sustainability report), and 2% were sustainability reports that were simplified. Most of the sustainability reports (both simple and thorough) that were analysed were created using the GRI methodology.

Instead of creating a sustainability report, many food processing companies (11%) in Hungary release other sustainability-related documents, like an environmental and quality policy, a supplier code of conduct, sustainability and shared values summary, and a corporate social responsibility statement. Six of the 52 companies had an energy expert report. Of the companies surveyed, 29% published information about their sustainability initiatives on their websites rather than creating a separate document on their sustainability performance. Foreign-owned businesses are more likely than Hungarian-owned businesses to report on their sustainability performance. Mitigation of climate change had the highest relative score among the 52 companies for the six taxonomy purposes. This was followed by the transition to a circular economy goal, followed by sustainable use and protection of water and marine resources. Larger food companies – those with more than 500 employees – have a higher proportion of taxonomy objectives in their sustainability reports than do smaller ones.

The continuation of this study, the publication of the results of the subsector analyses, was published as a study by Gombkötő et al. (2025). The results show that the content and quality of sustainability reporting by food companies varies considerably between subsectors. The subsectors of dairy products manufacturing, processing, and the preservation of fruit and vegetables scored the highest on sustainability objectives, excelling with regard to climate change mitigation and adaptation in particular. The significance of the study lies in the fact that the methodology provides an opportunity to track and re-examine the future reporting practices of companies following the legislative changes.

KPMG's (2024) analysis is based on data from the 250 largest companies in the world and the top 100 companies in 58 countries, including Hungary, and compares publicly available data from 5,800 companies, primarily based on reports published between 1 July 2023 and 30 June 2024. For the Hungarian analysis, it is important to note that most of the top 100 reporting companies are foreign-owned and report through their parent company, so the domestic results do not exclusively reflect actions taken in the country. The results show that nearly half of the European companies participating in the survey already publish data under the EU Taxonomy. In Hungary, 78% of the companies surveyed produce sustainability reports. 91% of Hungarian companies surveyed have set a carbon reduction target, an increase of 29 percentage points since 2022.

Szendrey and Harazin (2024) examined the reporting preparedness of companies based on a sample of criteria set out in the ESG Act. Their research shows that all but one of the companies that will be required to report from 2025 onwards have an ESG-focused document. More than half of the companies reporting from 2026 have a published document with an ESG focus, while the vast majority of companies reporting from 2027 do not yet have such a document. For each of the target groups, reporting companies mostly rely on GRI guidelines, but also use other sustainability frameworks (e.g. SASB, TCFD, CDP).

Around two thirds of the environmental and social footprint of large companies is linked to suppliers, so supply chains will play a major role in implementing ESG considerations for large companies. For this reason, although the scope of the regulation does not apply to all SMEs, it is expected that many more companies will be affected by compliance with sustainability aspects (Krisán, 2024).

Surman and Böcskei (2023) conducted a questionnaire survey among Hungarian small and medium-sized companies on the presence of the three pillars of sustainability in their operations, with a sample of 808 items. They found that economic sustainability is the most important pillar among Hungarian SMEs. Environmental and social impacts are secondary and are seen as a next milestone, which requires leadership and management committed to sustainability. The drive towards sustainability, the pressure on the organisation, is primarily felt from the consumer side, but social and employee expectations also represent a relatively high proportion. There is only slight pressure from competitors, and the bank's expectation is the least important pressure to operate sustainably. The use of KPIs, which is common among large companies, is not observed in SMEs with a purely Hungarian ownership structure. Overall, only 15% of the sampled companies have general KPIs, while only half (7.7%) of those using general KPIs have sustainability KPIs. Among the environmental KPIs, the following were reported by the surveyed companies: energy classification of the investments, emissions, CO2 savings, carbon neutrality rate, green fleet share, forest resource statistics. Just under 20 percent (19.3) of respondents had heard of the Sustainable Development Goals (SDGs) before. Among the environmental SDGs, the protection of oceans and seas is understandably not directly reflected in the operations of companies operating in Hungary, but neither are the SDGs on sustainable cities and communities and action on climate change.

Tóth and Szendrey (2024) also investigated the impact of ESG on the performance of SMEs based on secondary data. They conclude that SMEs that are aware of the importance of ESG have a competitive advantage over those that are not.

Makronóm Institute's 2024 research aims to assess the extent to which domestic suppliers are affected by ESG legislation, whether they are aware of its content and its potential impact on their own operations. The majority of respondents to the survey were small and medium-sized enterprises in the manufacturing sector, all of whom are suppliers to one or more enterprises. Although nearly 90 percent of respondents already have a partial understanding of ESG, only one-third of companies actually understand it in depth. Compared to a year ago, the percentage of companies that are familiar with ESG has increased by 17 percentage points. A fifth of medium-sized suppliers already have a sustainability strategy and a further third are planning to develop one. However, just over half of medium-sized suppliers have heard of the ESG law. Three-quarters of respondents expect ESG data requests from their customers, mainly on environmental issues. Based on their current readiness, half of the companies surveyed could meet their customers' ESG data requirements.

Győri (2024) at the Budapest Business University studied the motivations for sustainability responsibility among a representative sample of Hungarian SMEs. Their results show that SME managers (especially owners) accept and are committed to stricter regulations on sustainability. However, SMEs typically do not communicate on sustainability, if they do communicate, they do it in a different way than large companies, and they are not familiar with the technical terms used on the subject. However, compliance with the ESG framework will affect SMEs in the short term as an expectation within the supply chain. However, the capacity to undertake this responsibility is not always available, even for large companies, and for SMEs it can be a critical cost element. SMEs need awareness-raising, training and concrete tools to comply with ESG reporting, and large companies need to help them to meet sustainability requirements.

Szendrey (2024) examined ESG reporting practices among four banks in Hungary. In her survey, she found that while in 2019 almost all banks lacked disclosures on risk management, today almost all banks mention ESG risks in their banking risks. All four banks have long-term targets for CO2 emissions, with a strong commitment to green energy. The banks apply offsetting, i.e. they offset their carbon emissions by financing offset projects certified to the highest standards. They can also buy carbon credits.

Conclusions

In Hungary, the authorities are trying to create a supportive environment for companies with reporting obligations. For example, questionnaires to help businesses meet the minimum reporting requirements will be helpful. In addition, the Hungarian National Bank is at the forefront in Europe in facilitating capital flows for the green transition through its Green Programme. However, the learning process is also at an early stage for companies and the banking sector and while some positive results are visible, the significant change is expected to come with the introduction of mandatory reporting. Although the CSRD Regulation only requires mandatory sustainability reporting for a limited number of food processors, in practice more companies will be affected as large companies will hold their suppliers accountable for meeting environmental sustainability criteria. In order to generate the necessary data, it will be necessary to educate company managers and the company departments, to increase knowledge and to map and measure company processes. However, it is important for companies to focus not only on complying with mandatory administrative requirements, but also on taking real steps towards sustainability, which will be a requirement for competitiveness in the long term.

5.2. FINANCIAL RELEVANCE OF THE SAMPLE

The subchapter introduces and analyses financial data, focusing on selected companies in the Hungarian food, beverages, and tobacco industries for 2022, with a detailed breakdown of financial indicators across subsectors. Much like the Czech analysis, it systematically explores financial

concentration, highlighting key subsectors where selected companies hold significant shares, and concludes with data sources and visual aids supporting the analysis.

The following table contains the data of the Hungarian analysis in 2022 regarding the subsectors and main financial parameters (Table 14). It shows the shares of the main financial performance data for the examined group of companies compared to the subsectors and the whole sector regarding 2022. According to the data in 4 subsectors, shares above 60% were found for all the parameters analysed (Table 14, Figure 14).

Table 14

Main financial data and shares of the selected companies relative to the subsectors and to the whole sector (2022) in Hungary

Subsectors (NACE)	Number of companies	Number of selected firms	Share of revenue	Share of net profit	Share of total assets	Share of equity
Processing and preserving of meat and production of meat products (10.1)	573	18	60%	58%	64%	59%
Processing and preserving of fish, crustaceans and molluscs (10.2)	19	0	–	–	–	–
Processing and preserving of fruit and vegetables (10.3)	593	6	41%	60%	42%	47%
Manufacture of vegetable and animal oils and fats (10.4)	58	4	92%	84%	81%	78%
Manufacture of dairy products (10.5)	140	10	84%	86%	83%	85%
Manufacture of grain mill products, starches and starch products (10.6)	103	9	79%	64%	80%	67%
Manufacture of bakery and farinaceous products (10.7)	2,503	6	26%	15%	28%	25%
Manufacture of other food products (10.8)	776	10	65%	46%	67%	49%
Manufacture of prepared animal feeds (10.9)	186	11	70%	51%	72%	43%
Manufacture of beverages (11.0)	2,169	9	70%	72%	44%	36%
Manufacture of tobacco products (12.0)	3	3	98%	95%	97%	98%
Total (selected companies / whole sector)	**7,123**	**86**	**67%**	**62%**	**62%**	**53%**

Note: private enterprises are also included in the whole number of companies in food, beverages and tobacco industries
Source: Authors' own calculation based on the data derived from the purchased database: www.ceginformacio.hu, www.crefoport.hu, and using database of https://ec.europa.eu/eurostat/databrowser/view/sbs_ovw_act__custom_15475826/default/table?lang=en

We supplemented our V4 research with the results of the Hungarian previous research for 2020-2021 (Lámfalusi *et al*., 2024) using the same methodology. The number of investigated firms represented less than 1.3 percent of the total number of corporates in the sector in every year of 2020-2022 interval. However, in all three years, the main financial data for the groups of corporates under review represented significant share compared to the whole sector. The ratio of total net revenue, net profit and total assets exceeded 60% in all three years, while the ratio of equity

was higher than 50% in the observed interval (Table 15). Consequently, the ratios also reflected the strong financial concentration in the sector as a whole (Figure 13).

Table 15

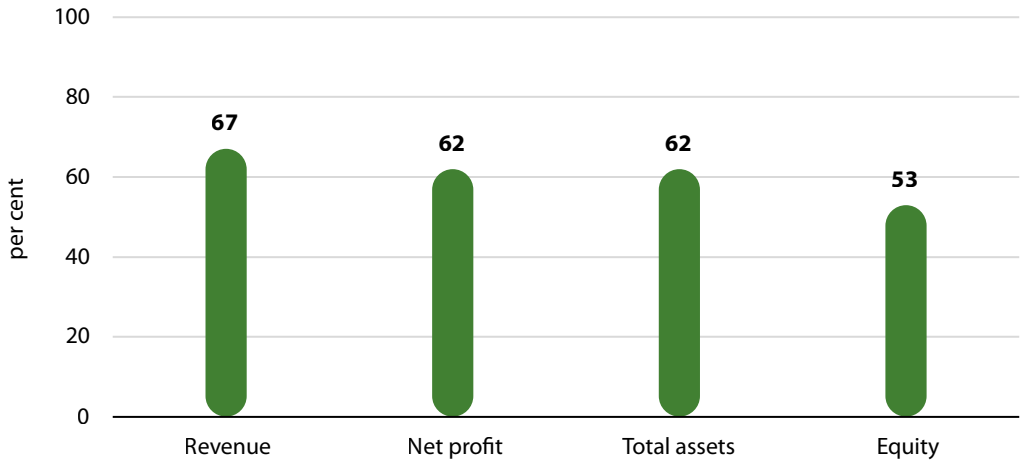
Share of the main financial characteristics of the selected Hungarian companies in relation to the whole national food processing sector (2020-2022)

Year / Designation	Share of revenue	Share of net profit	Share of total assets	Share of equity
2020	68%	67%	61%	55%
2021	70%	68%	64%	56%
2022	**67%**	**62%**	**62%**	**53%**

Note: In 2020-2021 the sample contained the same 82 companies, in 2022 86 companies were in the sample (71 were common)
Source: own compilation of the authors based on data of AKI and Céginformáció Kft. using Lámfalusi et al. (2024) as well

Figure 13

Share of the main financial characteristics of the selected Hungarian companies in relation to the whole national food processing sector (2022)

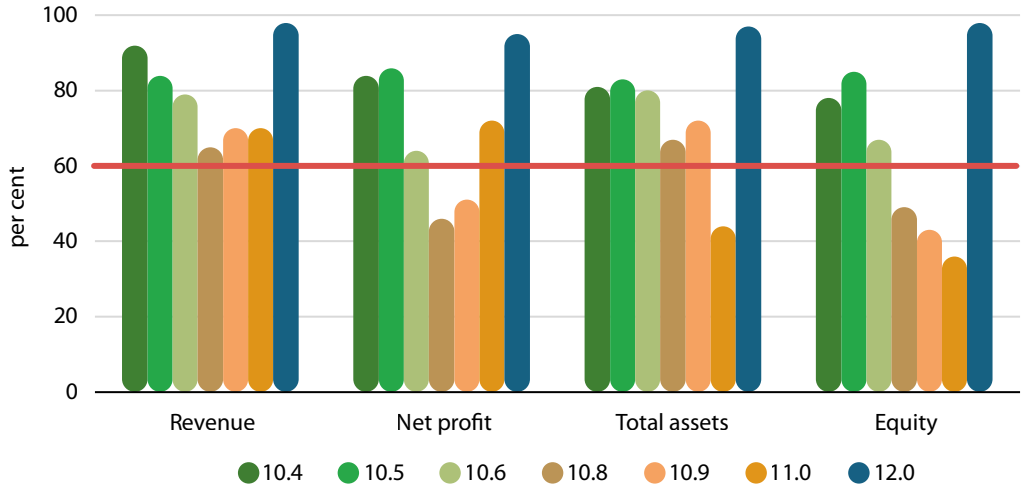


Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

According to the data in 4 subsectors, shares above 60% were found for all the parameters analysed (Figure 14). The financial role of the investigated companies is particularly significant in the subsectors of Manufacture of vegetable and animal oils and fats (10.4); Manufacture of dairy products (10.5), Manufacture of grain mill products, starches and starch products (10.6); and Manufacture of tobacco products (12.0). In addition, it is also worth considering subsectors of Manufacture of other food products (10.8) exceeding 60% share in revenue and total assets, Manufacture of prepared animal feeds (10.9) exceeding 60% share in revenue and net profit, Manufacture of beverages (11.0) exceeding 60% share in revenue and net profit.

Figure 14

Outstanding subsectors in Hungary (2022)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

In terms of financial concentration, those subsectors were considered highly significant in this research where all main financial parameters exceeded 60%. In Hungary the following 4 subsectors were outstandingly remarkable based on all investigated main financial data of 2022 in the financial sample (Figure 14):

Manufacture of food products (10.0) – a total of 23 firms

- Manufacture of vegetable and animal oils and fats (10.4) – 4 firms
- Manufacture of dairy products (10.5) – 10 firms
- Manufacture of grain mill products, starches and starch products (10.6) – 9 firms

Manufacture of tobacco products (12.0) – 3 firm

In summary, the Hungarian financial sample included 86 companies. We concluded that, compared to the main financial data for the food, beverages and tobacco sector as a whole, this sample of large companies represented significant proportions of the total turnover, net profit, total assets and equity. The number of investigated firms in the Hungarian financial sample was less than 1.5 percent of the total number of corporates in the food processing industry, but the shares listed above exceeded 50.0 percent in 2022 and also the 2 years before. The ratios of total net revenue, net profit and total assets exceeded 60% in 2022 and in the interval 2020-2022 as well, while the ratios of equity were higher than 50% in the investigated period. Consequently – similar to the results of the Czech Republic – the shares also reflected the strong financial concentration in the sector as a whole regarding the financial year of 2022.

In Hungary, 4 subsectors were outstandingly remarkable concerning the high shares where all main financial parameters exceeded 60%: manufacture of vegetable and animal oils and fats (10.4), manufacture of dairy products (10.5), manufacture of grain mill products, starches and starch products (10.6) and manufacture of tobacco products (12.0).

These four subsectors comprised a total of 26 companies out of the 86 companies in the financial sample. There was only one subsector in which the ratios were relatively low. This was the manufacture of bakery and farinaceous products subsector (10.7), with 6 companies. The above analysis demonstrated the financial concentration of the investigated Hungarian food processing industry.

5.3. RESULTS

The subchapter analyses the types of online available sustainability reports concerning the selected large companies in Hungarian food, beverages, and tobacco sector, categorising them based on their depth and availability using the types listed in the third subchapter of Chapter 3 (Methodology).

In addition, it presents a content analysis of these reports and other environmental documents using relative scoring approach, evaluating corporate sustainability efforts across various EU taxonomy objectives, including climate change mitigation, climate change adaptation, water resource management, the transition to a circular economy, pollution prevention and biodiversity protection, highlighting key priorities and gaps in each area. Furthermore, we also describe the activities with the highest relative scores within the outstanding taxonomy objectives.

5.3.1. Types of sustainability reports investigated

In Hungary, **46** of the 86 companies in the financial sample had a sustainability report available online or detailed information about their environmental activities on their website. The typology was the following for the investigated reporting period of 2021-2023:

- Detailed sustainability report (25 companies)
- Simplified sustainability report (5 companies)
- Other environmental document (13 company)
- Detailed website with figures (3 companies)

Following subsectors were identified based on percentage concerning those 46 companies had online sustainability reports compared to the number of companies in the financial sample (Table 16).

Table 16

Main subsectors in Hungarian sustainability sample compared to the financial sample (2022)

Subsectors (NACE)	Number of companies in sustainability sample	Number of companies in financial sample	Share of companies (%)
Processing and preserving of meat and production of meat products (10.1)	4	18	22
Processing and preserving of fruit and vegetables (10.3)	3	6	50
Manufacture of vegetable and animal oils and fats (10.4)	3	4	75
Manufacture of dairy products (10.5)	4	10	40
Manufacture of grain mill products, starches and starch products (10.6)	5	9	56
Manufacture of bakery and farinaceous products (10.7)	4	6	67
Manufacture of other food products (10.8)	8	10	80
Manufacture of prepared animal feeds (10.9)	6	11	55
Manufacture of beverages (11.0)	8	9	89
Manufacture of tobacco products (12.0)	1	3	33

Note: share of companies was calculated as follows: number of companies in sustainability sample divided by number of companies in financial sample *100
Source: Authors' own calculation

These are the total number of corporates in case where content analyses of sustainability information were done.

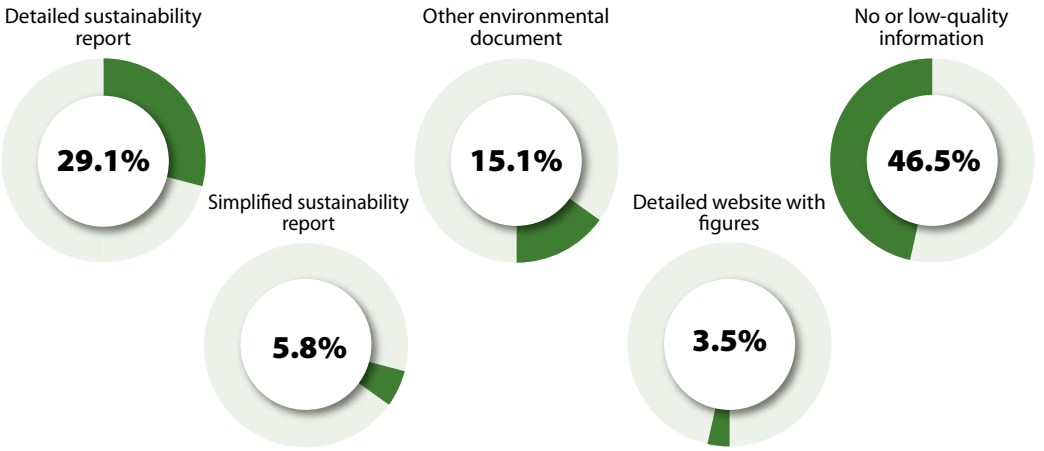
Most remarkable subsectors based on the above presented percentages were the followings:
- Manufacture of vegetable and animal oils and fats (10.4): 75%
- Manufacture of bakery and farinaceous products (10.7): 67%
- Manufacture of other food products (10.8): 80%
- Manufacture of beverages (11.0): 89%

These outstanding subsectors covered half of the firms (23) from the sustainability sample of 46 companies.

In the Hungarian financial sample, 46 companies had online sustainability reporting at an assessable level, while the remaining 40 companies either had no online sustainability information or the available information was considered to be of low quality during the research (Figure 15). For the remaining 40 companies, it can be stated that 18 companies had no online sustainability information, while 22 companies had only standard documents (e.g. ISO certificate) and/or an energy expert report and/or a short quality policy report, which were not analysed in this research.

Figure 15

Sustainability Reporting Practice in the Hungarian Food, Beverages and Tobacco Sector in the investigated period (2021-2023)



Source: authors' compilation

The figure shows the distribution of sustainability reporting practices among 86 companies in the financial sample of Hungarian food, beverages and tobacco sector (Figure 15).

- **No Specific Report**: 46.5 percent of companies (40) do not publish specific sustainability information. It can be stated that 18 companies had no online sustainability information, while 22 companies had only standard documents (e.g. ISO certificate) and/or an energy expert report and/or a short quality policy report, which were not analysed in this research.
- **Detailed Sustainability Report**: 29.1 percent of companies (25) produced a comprehensive sustainability report, the highest share among those that engage in some form of reporting. More than a half of detailed sustainability reports (19) were 'Global' companies' reports, i.e. – as we mentioned earlier in methodology chapter – in the case of the Hungarian subsidiary we assessed the sustainability report prepared by the parent company. Within this group, 10 reports were mandatory in line with NFRD (for the reason of 9 international 'Global' parent companies published detailed reports are listed in various stock exchanges and 1 company with Hungarian ownership is also a listed company). The rest of detailed sustainability reports (15) were voluntary.
- **Simplified Sustainability Report**: 5.8 percent of companies (5) issued a basic sustainability report with limited information. These shorter but environmentally comprehensive documents consisted of three groups: 3 were 'Global' companies' reports (within this group 1 report was mandatory where the parent company was listed), 1 was subsidiary's report and 1 was independent company's report.
- **Other Environmental Documents**: 15.1 percent of companies (13) issued a typically 1-10 pages long alternative environmental documents.
- **Detailed Website with Figures**: 3.5 percent of companies (3) disclosed sustainability-related data on a dedicated website with detailed numerical values.

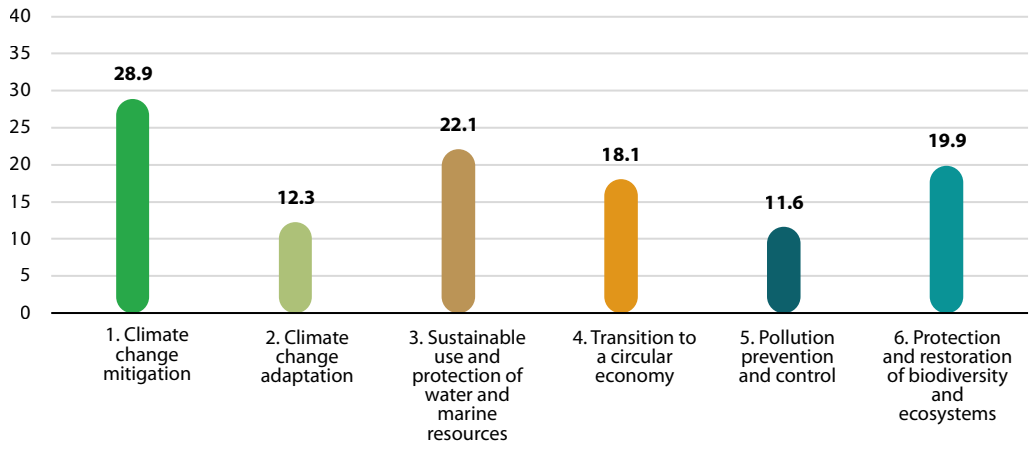
It can be seen that in Hungary companies produce a variety of sustainability documents in addition to the detailed reports of 'Global' companies. These documents are often simpler and shorter, but in most cases cover the most relevant environmental and taxonomy issues. Moreover, further examples can be found where it is clear that companies have already made efforts to produce sustainability information with appropriate content and figures on key environmental objectives even before the introduction of the CSRD, in a voluntary way. This shows that certain companies have engagement to prepare for the CSRD.

5.3.2. Content analysis of the sustainability reports using relative scores

For the 46 companies, among the 6 taxonomic objectives examined, Climate change mitigation had the highest relative score (28.9), followed by Sustainable use and protection of water and marine resources (22.1), after that the Protection and restoration of biodiversity and ecosystems was the next (19.9), and then the Transition to a circular economy objective (18.1). The other objectives had much lower relative scores (Figure 16).

Figure 16

Relative scores by EU taxonomy objectives in Hungary



Source: own compilation by the authors

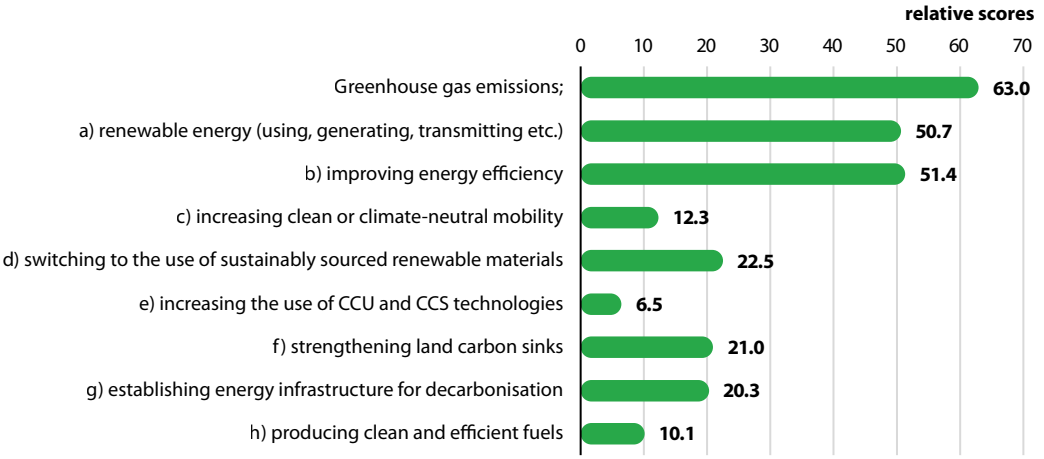
When analysing the activities of the objectives with the highest relative scores, the following results are obtained.

Within the climate change mitigation objective, the additionally assigned activity, called reduction of **'Greenhouse gas emissions (GHG)'** received the highest relative score (63.0). This indicates that the majority of companies in the Hungarian sustainability sample are strongly addressing the reduction possibilities and potential forms of CO_2 emission in their production and the whole value chain. More than a half of the 46 investigated corporates illustrate their carbon emission mitigation strategy with year-by-year comparisons. Within this group of companies,

19 firms made use of a concrete pre-determined net zero carbon emission strategy with clear and year-by-year controlled targets for 2030 or 2050. This was followed by (b) **'improving energy efficiency'** (51.4). Here, most companies are preparing a specific energy efficiency plan, have an energy saving programme, and are setting specific goals for measuring and comparing, controlling and reducing energy consumption year after year. This topic also includes obtaining various energy performance certificates. The third highest score (50.7) went to activity (a) 'renewable energy'. The other activities received much lower scores (Figure 17).

Figure 17

Relative scores of the activities of the climate change mitigation objective



Source: own compilation by the authors

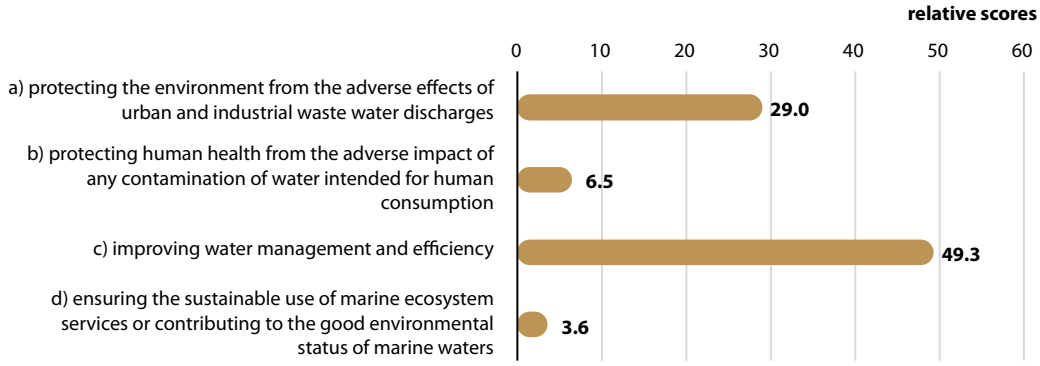
Within the area of Sustainable use and protection of water and marine resources objective, the most prominent activity is (c) '**improving water management and efficiency**', with a relative score of 49.3. Within this activity, the following important topics are illustrated with detailed numbers, tables and figures supplemented with specific targets by the majority of investigated Hungarian companies: monitoring, optimising and reducing water consumption; achieving regenerative water use; implementing effective water management activities; implementing complex water management systems; and improving water management efficiency by reducing water withdrawals. In addition, companies are also working to utilise water resources and improve water quality throughout their supply chain. The next important activity, namely (a) 'protecting the environment from the adverse effects of urban and industrial wastewater discharges' also appears with a high relative score (29.0) among the actions taken by companies within this objective (Figure 18).

For the Protection and restoration of biodiversity and ecosystem objective, the relative score for activity (c) '**sustainable agricultural practices**' was the highest (26.8), primarily due to the requirements imposed on suppliers to 'Global' companies. Within this activity, the following important areas are mentioned in the different sustainability documents: supporting, implement-

ing and developing regenerative and sustainable agricultural practices; applying best practices in soil management and water conservation; establishing direct relationship with farmers; using organic farming methods; encouraging farmers and suppliers to develop sustainable regenerative agricultural techniques and obtain environmentally sustainable farmer certificates. This outstanding activity was followed by (a) 'nature and biodiversity conservation' (20.3) and then (b) 'sustainable land use and management' with a relative score of 18.8. The activity (d) 'sustainable forest management' was less significant in the Hungarian sustainability sample, but it can be concluded that the investigated companies are starting to pay attention to preventing ecosystem degradation and deforestation (Figure 19).

Figure 18

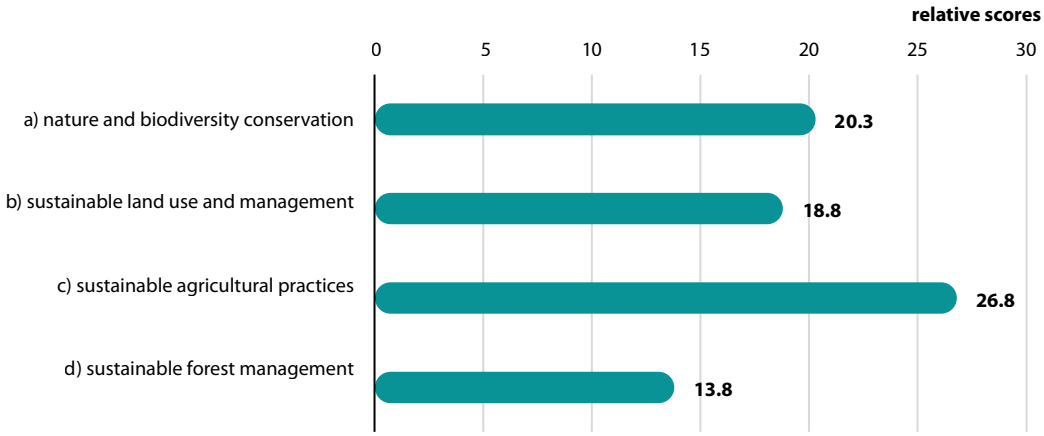
Relative scores of the activities of the sustainable use and protection of water and marine resources objective



Source: own compilation by the authors

Figure 19

The relative scores of the activities of the protection and restoration of biodiversity and ecosystem objective



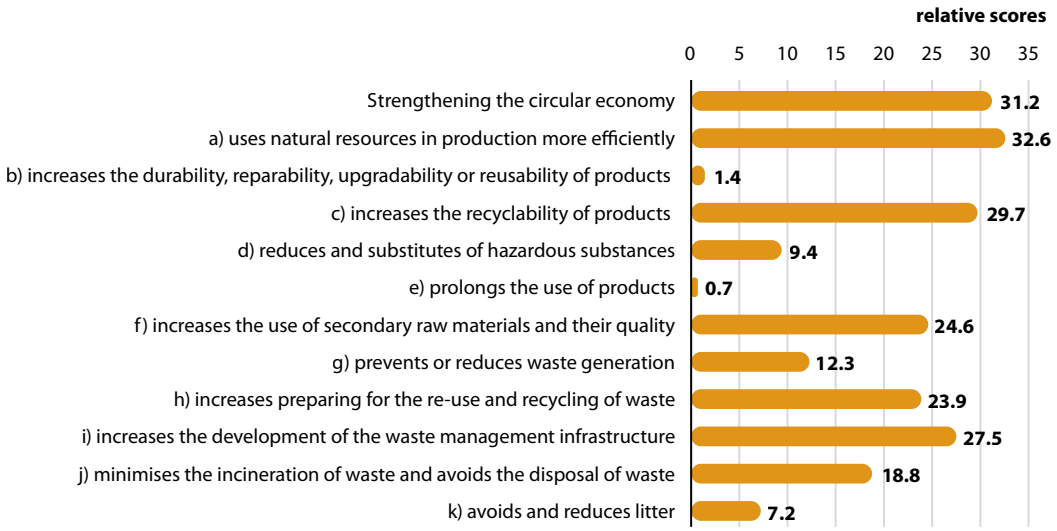
Source: own compilation by the authors

The highest relative score in the Circular economy transition objective was achieved in activity (a) '**efficient use of natural resources**' (32.6). In relation to this activity the following main topics are mentioned in the Taxonomy Regulation: using natural resources – including sustainably sourced bio-based and other raw materials – in production more efficiently. It includes reducing the use of primary raw materials or increasing the use of by-products and secondary raw materials. Furthermore, this activity also contains the resource and energy efficiency measures. The following most important listed activities are in the analysed reports: responsible procurement, responsible sourcing programmes, using more recycled and bio-based materials, focusing on bio-based ingredients, renewable and secondary raw materials, reducing plastic materials in packaging, investing in local recycling programmes, and increasing the proportion of reusable packaging.

The next important unique parameter – which was the second additionally assigned activity during the research – was called '**Strengthening circular economy (CE)**', which achieved a relative score of 31.2. Moreover, companies also pay attention to (c) 'increases of recyclability of products' (29.7) and waste management. The activity (i) 'increases the development of the waste management infrastructure' scored 27.5 and (h) 'waste reuse and recycling' scored 23.9. Furthermore, (f) 'increases the use of secondary raw materials' (24.6) was also important. At the same time, (b) 'increases the durability of products' and (e) 'prolongs the use of products' activities do not appear as measures among the companies surveyed, presumably because these measures are less meaningful in the food industry due to the perishable nature of food products (Figure 20).

Figure 20

The relative scores of the activities of the transition to a circular economy objective



Source: own compilation by the authors

Summarising the results, for the companies in the Hungarian sustainability sample, the highest relative score among the taxonomy objectives was Climate change mitigation (28.9), followed by Sustainable use and protection of water and marine resources (21.9), then Protection and restoration of biodiversity and ecosystems (19.9), and the fourth most prominent objective was the Transition to a circular economy objective (18.1).

Within the Climate change mitigation objective, the highest relative scores were achieved for GHG activity (added arbitrary during the research) (63.0) and (b) 'improving energy efficiency' (51.4) activity. Within the Sustainable use and protection of water and marine resources objective the (c) 'improvement of water management and efficiency' activity had the highest relative score (48.6). Concerning the Protection and restoration of biodiversity and ecosystems objective the (c) 'sustainable agricultural practices' activity got the most noteworthy relative score (26. 8), presumably due to the activities of the 'Global' companies which are focusing on theirs value chain and encouragement of suppliers' motivation regarding development of best practices in regenerative agriculture. Regarding the Transition to a circular economy objective, the (a) 'efficient use of natural resources' (32.6) was the most important activity, followed by the CE activity (31.2) added also arbitrarily during the research.

The Hungarian sustainability sample included 46 companies, but only 25 of them were so-called 'Global' companies. Thus, although 'Global' companies have a large impact on the relative scores and importance areas developed, it can be noted that for Hungary, both the voluntary reporting activities of independent domestically owned and independent foreign-owned (non 'Global') companies are improving. There are some Hungarian-owned companies that can be considered successful in preparing for the NFRD-CSRD transition.

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6. POLAND

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This chapter summarises the results of three main themes of our V4 research in case of Poland.

In the first subchapter, a literature review – regarding Corporate Sustainability Reporting in light of EU regulations, the practice of Non-Financial Reporting with a focus on the agri-food sector, and challenges in implementing CSR Activities – is presented. After that, the financial concentration of the analysed Polish industry is demonstrated. In the third subchapter, detailed relative scoring results of the content analysis of sustainability sample are presented for Poland in terms of taxonomy objectives and activities.

6.1. LITERATURE REVIEW

Introduction

In business operations the need to address global challenges of sustainable development is increasingly gaining in importance, a tendency that is reflected in the appropriate management of environmental, social, and governance factors. This trend is further amplified by growing environmental pressures, changing expectations on the part of investors and the financial sector, legislative changes, and increasing public awareness. Meanwhile, additional motivators include new business opportunities, such as the growing demand for sustainable products and services, improving attractiveness in the labour market, and responding to changing consumer behaviour.

This section of the book provides a literature review related to various aspects of green finance in Poland, including regulatory aspects and practices of CSR reporting implementation, with a particular focus on the agri-food sector. Challenges related to the implementation of sustainable development reporting are also highlighted.

Corporate Sustainability Reporting in Poland in Light of EU Regulations

CSR reporting in Poland remained entirely optional until the transposition of Directive 2014/95/EU into the national legal framework. Companies had discretion in reporting non-financial data (Małkowska and Walczak, 2023). As Hawrysz (2017) notes, research on non-financial reporting conducted prior to the introduction of the above directive indicates that only 10% of Polish companies prepared CSR reports based on external standards. Furthermore, among 310 companies listed on the main market of the Warsaw Stock Exchange (GPW) as of May 1, 2012, only 12 entities

produced a separate CSR report. The data in these reports were characterised by a high level of generality (Hawrysz, 2017).

The incorporation of the provisions of Directive 2014/95/EU in Poland was primarily achieved through an amendment to the Accounting Act (UOR) dated September 29, 1994 (Journal of Laws 2023, item 120). Under the UOR, the obligation to report non-financial information was extended to entities such as banks, insurance companies, issuers, as well as investment funds, pension funds, entities seeking or intending to seek admission to trading on one of the regulated markets within the European Economic Area (EEA), issuers of securities admitted to trading in an alternative trading system, domestic payment institutions, and electronic money institutions. These entities were required to report non-financial information if, in the financial year for which the financial statement was prepared and in the preceding year, they exceeded the following thresholds (Sadowski, 2023):

- 500 employees – in terms of average annual employment calculated in full-time equivalents, and
- 85 million PLN – in terms of total assets on the balance sheet at the end of the financial year, or 17 million PLN – in terms of net revenue from the sale of goods and products for the financial year.

Entities meeting the above criteria were required to submit mandatory non-financial reports for the first time for the year 2017. At the same time, the law allowed flexibility in the form and choice of reporting standards (proprietary, national, EU, or international standards, norms, or guidelines) (Krużycka, Martyniuk, 2020).

Currently, a significant influence on the standardisation of CSR reporting rules in Poland, as in other EU countries, is exerted by EU Directive 2022/2464 on corporate sustainability reporting. The CSRD Directive came into force on January 5, 2023. EU member states are required to transpose it into national law by July 6, 2024. To this end, a four-phase timeline has been established for implementing the new obligations by entities (Małkowska and Walczak, 2023):

1. The largest entities, which are already reporting non-financial information under the Accounting Act, will be required to apply the standards mandated by Directive 2022/2464 when reporting CSR for the 2024 financial year;
2. In 2025, other large entities will present their first reports;
3. Small and medium-sized listed companies will submit their first CSR reports in compliance with the introduced ESG reporting standards for the 2026 financial year;
4. Entities outside the EU will be required to publish reports for financial years starting on January 1, 2028, provided specific criteria are met.

The obligation of non-financial reporting applies to all entities that meet at least two of the following criteria simultaneously (Sadowski, 2023):

- Average annual employment exceeding 250 people, and
- A balance sheet total exceeding 20 million EUR or net revenues exceeding 40 million EUR.

Additionally, the obligation for non-financial reporting also applies to all publicly listed companies, as well as non-European enterprises, provided these entities generate revenues from sales in EU member states exceeding 150 million EUR and have a branch or subsidiary within the EU.

It is important to note that the CSRD Directive is part of a broader sustainable finance agenda, imposing a duty on companies and financial institutions to enhance transparency regarding their impact on sustainability factors. Regulations governing this include the EU Regulation 2019/2088 (SFDR) on sustainability-related disclosures in the financial services sector (covering banks, insurance companies, investment firms, and financial advisors) (Cicirko, 2022) and the Taxonomy Regulation (EU Regulation 2020/852).

The introduction of mandatory non-financial reporting significantly impacted the development of ESG reporting in Poland and contributed to an increase in the amount of ESG information published by companies. The emergence of new and expanded regulatory requirements further strengthened companies' reporting practices. Although the quality of ESG information reported by Polish companies is improving, its consistency, comparability, and reliability still vary (GPW, 2023). Among the initiatives aimed at improving corporate transparency in the Polish capital market and encouraging companies to systematically enhance their ESG reporting, the RESPECT Index was launched in 2009. It was the first index in Central and Eastern Europe to include socially responsible companies. In 2019, it was replaced by the WIG-ESG Index, which also serves as the underlying instrument for financial products available on the market, such as passive funds and structured products listed on the Warsaw Stock Exchange.

The Practice of Non-Financial Reporting with a Focus on the Agri-Food Sector

Sienkiewicz *et al*. (2023) emphasise that the financial market plays a vital role in developing offerings that support environmentally friendly and socially responsible investments and projects. On the one hand, this market is itself subject to ESG-related regulations, while on the other, it acts as a leader of change. Recently, the importance of sustainable finance has been growing, particularly in investment processes and credit risk assessment. Polish companies are increasingly facing more stringent ESG requirements, both from international companies that are their business partners and from financial institutions.

Lament (2023) evaluates the ESG initiatives undertaken by insurance companies in Poland. The author notes that ESG reporting standards from other, more developed insurance markets are being transferred to the Polish market. When distributing insurance investment products, intermediaries are required to conduct mandatory assessments of clients' sustainability preferences and to consider these expectations in the selection process for insurance investment products. This also applies to clients in the agri-food sector.

There are several reports that present the state of ESG implementation in Polish enterprises. The results of selected reports are presented below.

The report "Annual CSR Outlook in Poland 2017" analysed by Fijałkowska and Macuda (2019) shows that less than half of large and medium-sized companies in Poland currently engage in CSR activities. Another 15% report that they are considering becoming involved in CSR. The proportion of companies practicing CSR is higher among those with foreign capital, with the highest rate (61%) found among companies with exclusively foreign capital.

Based on the "Responsible Business in Poland. Good Practices Reports," Firlej (2021) analyses the significance of socially responsible corporate activities in achieving sustainable development goals in Poland. The author concludes that between 2016 and 2020, the number of new practices and companies involved in all areas of corporate social responsibility increased by several dozen to several hundred percent. This unequivocally demonstrates a rise in awareness among business owners, who are recognising that, in addition to striving for profit, concern for the well-being of the company's internal and external environment is equally important.

Badowski *et al*. (2022), in the PwC report on ESG in consumer goods and retail, emphasise that this sector is particularly sensitive to sustainability issues. According to the report, sustainable development is still not adequately integrated into the business strategies of companies in Poland. In 2022, only 20% of the surveyed Polish companies declared clearly defined sustainability goals in their business strategies, whereas this percentage rises to 67% among companies with foreign headquarters. Only 25% of the surveyed enterprises have implemented or are implementing a significant number of processes related to sustainability reporting. Moreover, as many as 81% of respondents are currently not technologically prepared for such reporting.

According to the latest PwC Poland report from 2024, "A Bumpy Road to Sustainability: Technology, Strategy, and Reporting – ESG in Consumer Goods and Retail" 76% of the surveyed companies are preparing or working on preparations for reporting in line with the latest European Sustainability Reporting Standards (ESRS). While an increasing number of companies are planning to publish non-financial reports, the pace of change remains insufficient. As much as 65% of the surveyed companies either do not publish non-financial reports at all or have only declared their intention to do so.

The report "CSR in Practice" prepared by the French – Polish Chamber of Commerce presents research involving 128 enterprises and 1,087 adult Poles. The results show that over half of the surveyed companies conducted CSR/ESG reporting, with most utilising one of the global standards. Legal regulations, such as the necessity to comply with European requirements, including reporting, were identified as the most significant factors driving the development of CSR/ESG in Poland. These replaced "softer" factors, such as knowledge transfer, sharing best practices, or stakeholder expectations. Other key reasons for companies engaging in CSR/ESG activities

included enhancing organisational image and meeting stakeholder expectations (customers and business partners). Regarding consumers, the study found that more than 60% of adult Poles believe companies should be involved in combating climate change and protecting the environment. However, only one-fifth of respondents would be willing to pay more for products from companies undertaking such actions.

The topic of sustainable finance is also a foundation for own research conducted by scientists, whose selected results are presented below.

According to studies by Mućko *et al.* (2021) conducted on a group of 103 respondents (84.5% representing small and medium-sized enterprises and 15.5% representing large entities), introducing sustainable development reporting by SMEs requires much more than implementing a unified and simplified reporting standard. Financial assistance systems, technological support, and new legislative initiatives are also needed. Furthermore, a change in the perception of sustainable development by SMEs and their customers is crucial. The authors emphasise that this shift may be the most challenging aspect to implement.

Gigol (2024) in his research examines to what extent 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 (N = 543). The majority of respondents who have an influence on the company believed that responsible management, including CSR, is mainly a public relations strategy. The hierarchy of factors influencing a company's competitiveness is market-oriented, at the expense of meeting environmental needs and addressing local community concerns. The author concludes that Polish managers prefer a market-driven and more strategic approach to CSR in business.

Kozáková *et al.* (2023) describe selected aspects of CSR in the business practices of companies from the Visegrad countries (Czech Republic, Poland, Slovakia) and compare the results of 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. The authors conclude that CSR has become a prominent aspect of business practice in the Visegrad region, driven by increasing awareness of social and environmental concerns. While challenges still exist, the commitment to CSR is expected to continue shaping the direction of business practices in the Czech Republic, Poland, and Slovakia, ultimately contributing to a more sustainable and responsible business environment. Regarding Poland, the study was conducted on a sample of 100 Polish companies, of which 25 were subsidiaries of multinational corporations, and 75 were companies with domestic capital. The results indicate that foreign-owned companies are more likely to engage in CSR activities than domestic companies. Over half of the analysed companies did not have a CSR-related structure, and only 12% of the companies had a separate unit responsible for these activities.

In the existing literature, issues related to CSR in companies operating within the food supply chain in Poland are relatively 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; Gołębiewski 2023).

Firlej (2018) emphasises that the modern agri-food sector has been involved in activities related to adhering to and developing corporate social responsibility principles for some decades. The author analyses selected CSR activities in the food industry, using the alcoholic beverage sector as an example. He concludes that nowadays, the implementation of CSR principles is a necessity and, at the same time, an additional intangible resource that generates value and competitive advantage for food companies.

Bobola A. (2014) analysed the websites of 18 Polish food industry companies listed on the Warsaw Stock Exchange in 2014. One-third of the companies surveyed declared engaging in any CSR activities, two companies were permanently cooperating with non-governmental organisations, five reported implementing best practices in the Responsible Practices Ranking, and one company had implemented a CSR strategy and produced a report on its activities. The author argues that the implementation of CSR principles, in the long term, provides not only environmental and social benefits but also ensures sustained growth in the economic value of the company (including intangible values such as culture, reputation, knowledge, and experience).

Gołębiewska *et al*. (2022) conducted research among dairy cooperatives. Their study analysed four aspects related to corporate social responsibility (CSR), namely: understanding the CSR concept, evaluating the implementation of CSR areas, the degree to which the company identifies the goals/needs of stakeholders, and which area is considered key in the company's approach to sustainable development. The research showed that companies consider the application of fair market practices and actions for local communities to be the most important. The indication of logistical processes as also important in the context of sustainable development suggests that companies are increasingly recognising the impact of their activities on the environment. It was also shown that the approach to CSR was not influenced by the size of the company, measured by product sales value, as both smaller and larger companies exhibited the same elements of corporate social responsibility.

Wołoszyn *et al.* (2012) conducted research among 137 micro, small, and medium-sized agribusinesses enterprises in rural areas of the Mazowieckie Voivodeship, the region encompassing Poland's capital, Warsaw. Based on the conducted analyses, the authors conclude, among other things, that entrepreneurs lack knowledge in the area of responsible business and, to some extent, engagement in acquiring it.

Ratajczak (2013) surveyed 174 small and medium-sized agri-businesses operating in rural areas of Warmia and Mazury regarding their opinions on the CSR concept. The study showed that almost

30% of businesses confirmed that socially responsible actions brought economic benefits to the company. Nearly half of the respondents did not express an opinion on the viability of implementing CSR principles in business practice. The author emphasises that enterprises, especially small and medium-sized ones, often have little or no awareness of the importance of CSR, which is why it is necessary for promoting institutions to increasingly highlight its significance in business practice (including in agri-business) both in the domestic and foreign markets.

In the same province, Siemiński (2023) conducted research on the perception of CSR among managers of small and medium-sized enterprises in the food industry. Based on the research, the author concludes that the importance of socially responsible values, according to the surveyed managers employed in the food industry, is higher than the average value assigned by the small and medium-sized enterprise sector. The respondents point to the important role of ethical standards in processes carried out in their companies, although this seems to be a declarative attitude. A relatively small penalty for non-compliance with ethical standards does not create much pressure to engage significant resources in CSR activities. Most of the activities in this area are not systematised, formalised, or expressed in internal codes of ethical conduct.

Stawicka (2017) emphasises that responsibility, especially in the agri-food sector, is a process, a continuous effort to shape and maintain the highest social, environmental, and economic standards. It is the stakeholders – consumers, employees, suppliers – who will decide whether they want to establish relationships with companies that are indifferent to issues of responsibility and sustainable development or instead with those that are striving to implement changes toward CSR. The author argues that deepening knowledge and a stronger focus on improving human capital (education, further training, self-improvement) are essential. There is a need for more initiatives at the national and regional levels to support CSR initiatives and strategies taking into account stakeholder maps, industry specifics, and the strengths and weaknesses in the surrounding environment.

Challenges in Implementing CSR Activities

As the literature review shows, the implementation of CSR in a business can be a difficult and time-consuming process. The implementation process depends on – to a large extent – the level of awareness of its importance among managerial staff.

Among the challenges associated with implementing CSR, the following are highlighted: the rapid pace of legislative changes (which creates increasing knowledge requirements), the need for intensive employee training, and the issue of the availability of qualified personnel in this area. There is also the risk of losing competitiveness due to the costs of adapting to new requirements. Therefore, high costs can sometimes be an obstacle to implementing CSR.

On the other hand, failure to meet customer requirements threatens losing market share, as consumers are increasingly link purchases with the values they support. Consumers thus play a key role in the ESG area, forcing companies to prioritise sustainability issues and regularly stay informed about them.

This makes it essential to promote awareness and increase knowledge of the essence and principles of CSR among entrepreneurs, especially SMEs. Training and studies with practical guidance facilitating the adoption of CSR are necessary for this purpose.

Summary

ESG is gradually being perceived not as an additional, voluntary action for the environment or society, but as another area regulated by laws, engaging an increasing number of enterprises, either directly or indirectly.

The growing number of regulations, the gradual reorientation of financial flows towards sustainable investments, and social pressure contribute to the systematic growth of the importance of sustainable development in business strategies. This is also crucial in building competitive advantage for companies, including those in the food industry.

At the same time, the role of financial institutions in supporting the implementation of sustainable development principles must be emphasised. Entities operating in the agri-food sector, including agriculture, especially in terms of introducing smart IT and AI solutions that contribute to the implementation of ESG goals, will have the opportunity to use the financial instruments provided by these institutions.

6.2. FINANCIAL RELEVANCE OF THE SAMPLE

The subchapter is structured so as to introduce and analyse financial data, focusing on selected companies in the Polish food, beverages, and tobacco industry for 2022, with a detailed breakdown of financial indicators across subsectors. In a manner similar to the Czech and Hungarian analyses, it systematically explores financial concentration, highlighting key subsectors where selected companies hold significant shares, and concludes with data sources and visual aids supporting the analysis.

The following table contains the data of the Polish analysis in 2022 regarding the subsectors and main financial parameters (Table 17). It shows the shares of the main financial performance data for the examined group of corporates compared to the subsectors and the whole sector regarding 2022. According to the data in 8 subsectors, shares above 60% were found for all the parameters analysed (Table 17, Figure 22).

Table 17

Main financial data and shares of the selected companies relative to the subsectors and to the whole sector (2022) in Poland

Subsectors (NACE)	Number of companies	Number of selected firms	Share of revenue	Share of net profit	Share of total assets	Share of equity
Processing and preserving of meat and production of meat products (10.1)	3,060	76	72%	62%	75%	75%
Processing and preserving of fish, crustaceans and molluscs (10.2)	315	14	78%	61%	79%	77%
Processing and preserving of fruit and vegetables (10.3)	1,394	33	62%	51%	64%	66%
Manufacture of vegetable and animal oils and fats (10.4)	239	9	85%	72%	81%	79%
Manufacture of dairy products (10.5)	945	48	87%	82%	88%	92%
Manufacture of grain mill products, starches and starch products (10.6)	532	21	75%	56%	70%	70%
Manufacture of bakery and farinaceous products (10.7)	8,743	24	49%	47%	63%	71%
Manufacture of other food products (10.8)	2,490	49	74%	64%	82%	86%
Manufacture of prepared animal feeds (10.9)	662	30	79%	66%	80%	82%
Manufacture of beverages (11.0)	790	28	86%	80%	81%	82%
Manufacture of tobacco products (12.0)	28	5	99%	76%	98%	99%
Total (selected companies / whole sector)	**19,198**	**337**	**77%**	**65%**	**78%**	**81%**

Note: private enterprises are also included in the whole number of companies in food, beverages and tobacco industries
Source: Authors' own calculation based on the data derived from the purchased database: www.ceginformacio.hu, www.crefoport.hu, and using database of https://ec.europa.eu/eurostat/databrowser/view/sbs_ovw_act__custom_15475826/default/table?lang=en

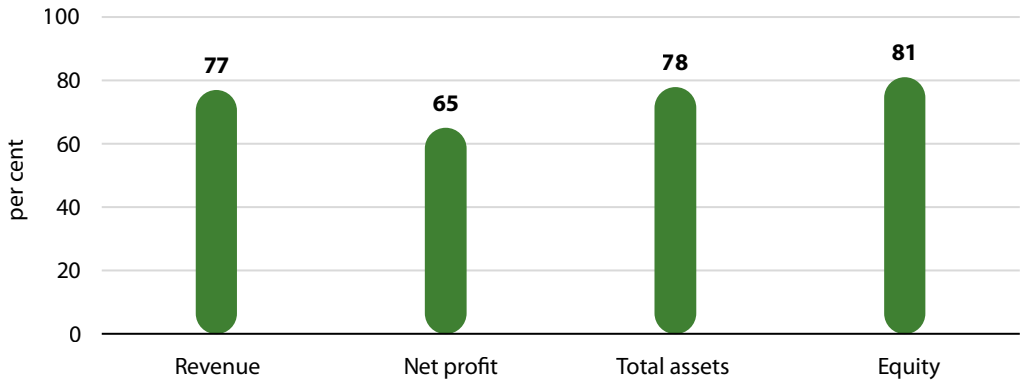
The number of investigated Polish firms represented less than 1.8 percent of the total number of corporates in the sector in 2021-2022 interval, focusing on the financial year of 2022.

The data table presents an overview of the financial performance of selected companies within various subsectors of the Polish food-processing industry in 2022. The table highlights the share of revenue, net profit, total assets and equity held by these financially selected companies relative to the total number of firms within each subsector and the entire food-processing industry. The data is sourced from Céginfomáció.hu Kft, indicating a compilation of financial information specific to Polish located companies.

The ratio of net profit exceeded 60% in 2022, while the ratios of total net revenue and total assets were higher than 70% and share of equity exceeded 80% (Table 17). Consequently, the ratios also reflected the strong financial concentration in the sector as a whole in Poland (in a manner similar to the Czech and Hungarian financial samples), regarding the financial year of 2022 (Figure 21).

Figure 21

Share of the main financial characteristics of the selected Polish companies in relation to the whole food processing sector (2022)

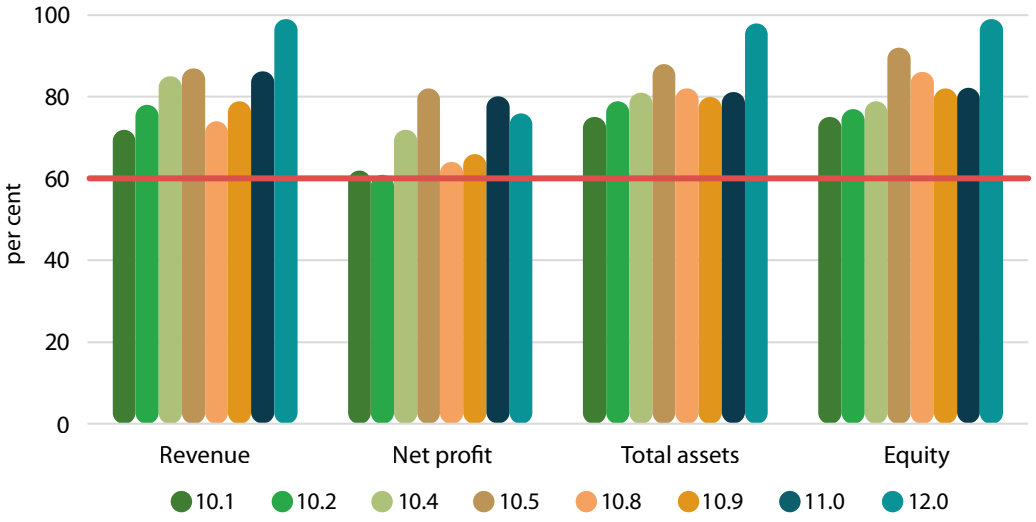


Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

According to the data in 8 subsectors, shares above 60% were found for all parameters analysed (Figure 22). The financial role of the investigated companies is particularly significant in the sub-sectors of Processing and preserving of meat and production of meat products (10.1); Processing and preserving of fish, crustaceans and molluscs (10.2); Manufacture of vegetable and animal oils and fats (10.4); Manufacture of dairy products (10.5); Manufacture of other food products (10.8); Manufacture of prepared animal feeds (10.9); Manufacture of beverages (11.0); and Manufacture of tobacco products (12.0).

Figure 22

Outstanding subsectors in Poland (2022)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

In terms of financial concentration, those subsectors were considered highly significant in this research where all main financial parameters exceeded 60%. In Poland the following 8 subsectors were outstandingly remarkable based on all investigated main financial data of 2022 (Figure 22):

Manufacture of food products (10.0) – a total of 226 firms

- Processing and preserving of meat and production of meat products (10.1) – 76 firms
- Processing and preserving of fish, crustaceans and molluscs (10.2) – 14 firms
- Manufacture of vegetable and animal oils and fats (10.4) – 9 firms
- Manufacture of dairy products (10.5) – 48 firms
- Manufacture of other food products (10.8) – 49 firms
- Manufacture of prepared animal feeds (10.9) – 30 firms

Manufacture of beverages (11.0) – 28 firms

Manufacture of tobacco products (12.0) – 5 firms

In summary, the Polish financial sample included 337 large companies based on the Article 3 of Directive 2013/34/EU. We concluded that, compared to the main financial data for the food, beverages and tobacco sector as a whole, this sample of large corporations represented significant proportions of the total turnover, net profit, total assets and equity. The number of investigated firms in the Polish financial sample was less than 1.8 percent of the total number of corporates in the food processing industry, but the shares listed above exceeded 70.0 percent on average in 2022. The ratio of equity exceeded 80% in 2022, while the ratios of revenue and total assets were higher than 70%, and the share of net profit exceeded 60% in the investigated period. Consequently – similar to the results of the Czech Republic and Hungary – the shares also reflected the strong financial concentration in the sector as a whole in the financial year of 2022.

In Poland, 8 subsectors were especially remarkable in terms of the high shares where all main financial parameters exceeded 60%: processing and preserving of meat and production of meat products (10.1), processing and preserving of fish, crustaceans and molluscs (10.2), manufacture of vegetable and animal oils and fats (10.4), manufacture of dairy products (10.5), manufacture of other food products (10.8), manufacture of prepared animal feeds (10.9), manufacture of beverages (11.0), manufacture of tobacco products (12.0).

These eight subsectors comprised a total of 259 firms out of the 337 companies in the financial sample. There was only one subsector in which the ratios were relatively low. This was the manufacture of bakery and farinaceous products subsector (10.7), with 24 companies. The above detailed analysis demonstrated the financial concentration of the investigated Polish food processing industry.

6.3. RESULTS

This subchapter analyses the types of online available sustainability reports concerning the narrower group of selected large companies in Polish food, beverages, and tobacco sector. Given the Polish financial sample size (337 firms), our sustainability content analysis was restricted to companies with more than 500 employees. Thus, the Polish narrower financial sample contained 107 companies.

For transparency, the research was focused on the online available sustainability documents of this narrower group of large firms, categorising the environmental reports based on their depth and availability using the types listed in the third subchapter of Chapter 3 (Methodology).

In addition, this Polish subchapter also presents – in a manner similar to the Check and Hungarian analyses – a content analysis of selected reports and other environmental documents using relative scoring approach, evaluating corporate sustainability efforts across various EU taxonomy objectives, including climate change mitigation, climate change adaptation, water resource management, the transition to a circular economy, pollution prevention and biodiversity protection, highlighting key priorities and gaps in each area. Furthermore, the activities with the highest relative scores within the outstanding taxonomy objectives are also described.

6.3.1. Types of sustainability reports investigated

Due to the large sample size (337 firms) in Poland, the research was focused on companies with more than 500 employees (107 corporates). In selecting the Polish sustainability sample, we aimed to analyse the most relevant companies from the subsectors that are highly represented in the financial sample. At the same time, it was also important that the Polish sustainability sample should include companies that are also actors of common outstanding subsectors of the V4 countries.

The most relevant **31** companies among 107 corporations were analysed regarding their online available sustainability information.

The typology was the following for the investigated reporting period of 2021-2023:

- Detailed sustainability report (13 companies)
- Simplified sustainability report (11 companies)
- Other environmental document (3 company)
- Detailed website with figures (4 companies)

The following subsectors were identified based on percentage concerning those 31 companies had online sustainability reports compared to the number of companies in the financial sample relative to the narrower financial sample (107).

Table 18

Main subsectors in Polish sustainability sample compared to the narrower financial sample (2022)

Subsectors (NACE)	Number of companies in sustainability sample	Number of companies in narrower financial sample	Share of companies (%)
Processing and preserving of meat and production of meat products (10.1)	6	23	26
Processing and preserving of fish, crustaceans and molluscs (10.2)	1	6	17
Processing and preserving of fruit and vegetables (10.3)	0	8	0
Manufacture of vegetable and animal oils and fats (10.4)	**1**	**1**	**100**
Manufacture of dairy products (10.5)	4	18	22
Manufacture of grain mill products, starches and starch products (10.6)	1	3	33
Manufacture of bakery and farinaceous products (10.7)	4	12	33
Manufacture of other food products (10.8)	**7**	**19**	**37**
Manufacture of prepared animal feeds (10.9)	**2**	**4**	**50**
Manufacture of beverages (11.0)	**4**	**8**	**50**
Manufacture of tobacco products (12.0)	1	5	20

Note: share of companies was calculated as follows: number of companies in sustainability sample divided by number of companies in the narrower financial sample in Poland *100
Source: Authors' own calculation

These are the total number of corporates for whom content analyses of sustainability information were done (Table 18).

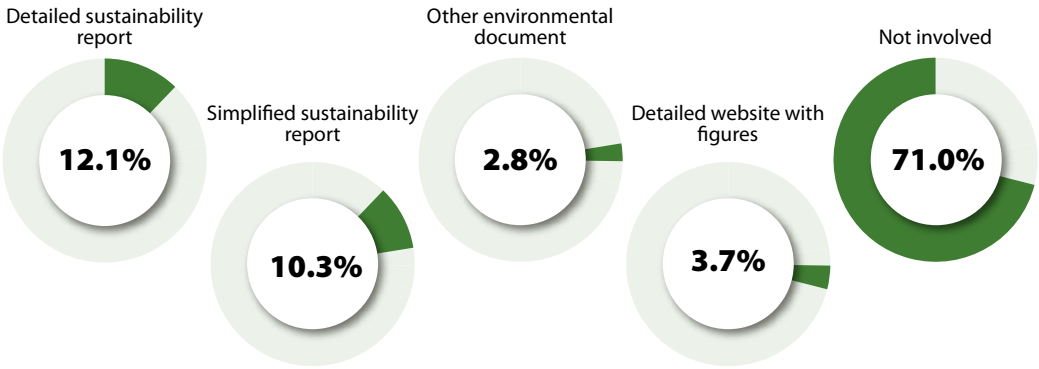
The most remarkable subsectors based on the above presented percentages were the following:

- Manufacture of vegetable and animal oils and fats (10.4): 100%
- Manufacture of other food products (10.8): 37%
- Manufacture of prepared animal feeds (10.9): 50%
- Manufacture of beverages (11.0): 50%

These outstanding subsectors covered almost half of the firms (14) from the Polish sustainability sample of 31 companies.

Figure
23

Sustainability Reporting Practice in the Polish Food, Beverages and Tobacco Sector in the investigated period regarding the most relevant firms (2021-2023)



Source: authors' compilation

The Figure shows the distribution of sustainability reporting practices in the narrower financial sample, among 107 large companies with more than 500 employees in the Polish food, beverages and tobacco sector (Figure 23).

- **Not involved**: Given that the largest sample size among the V4 countries is to be found in Poland, the 31 most relevant companies in the Polish case were selected for analysis. Consequently, 71.0 percent of the narrower financial sample was not involved in the research. This is an important aspect of the research that will definitely be worth expanding and developing in the future.
- **Detailed Sustainability Report**: 12.1 percent of companies (13) produced a comprehensive, detailed sustainability report, the highest share among those Polish investigated companies that engage in some form of reporting. More than a half of detailed sustainability reports (11) were 'Global' companies' reports, i.e. – as we mentioned earlier in methodology chapter – in the case of the Polish subsidiary we assessed the sustainability report prepared by the parent company. Within this group, 7 reports were mandatory in line with NFRD (for the reason of all the 7 international 'Global' parent companies which published detailed reports are listed corporations). The rest of detailed sustainability reports (6) were voluntary.
- **Simplified Sustainability Report**: 10.3 percent of companies (11) issued a basic sustainability report with limited information. These shorter but environmentally comprehensive documents consisted of two groups: 3 were 'Global' companies' reports (within this group only 1 report was mandatory where the parent company was listed stock exchange), 4 were subsidiaries' report and 4 were independent companies' report. In summary, among simplified reports 1 was mandatory and 10 were voluntary.
- **Other Environmental Documents**: 2.8 percent of companies (3) issued a typically 1-10 pages long alternative environmental documents.

- **Detailed Website with Figures**: 3.7 percent of companies (4) disclosed sustainability-related data on a dedicated website with detailed numerical values.

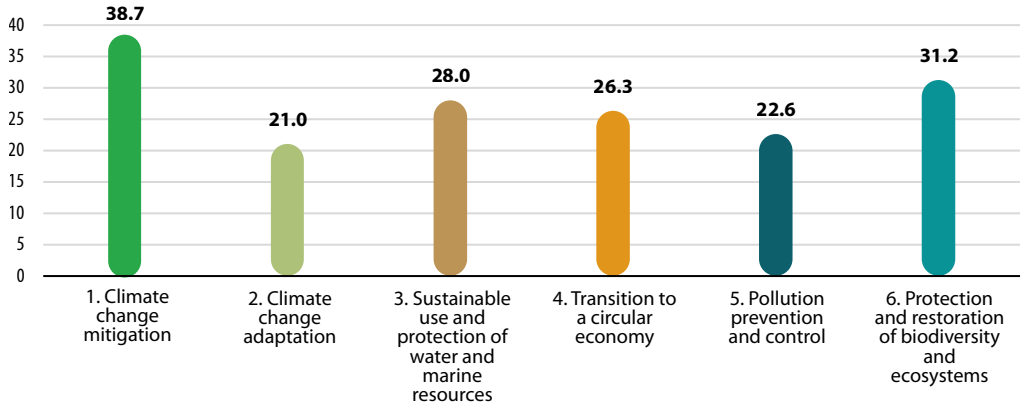
As in Poland's case we concentrated on a narrower financial sample, the number of investigated companies was narrower when viewed in relation to the whole financial sample, but the results were still interesting and insightful. It can be stated that in Poland companies produce a variety of sustainability documents in addition to the detailed reports of 'Global' companies. These documents are often simpler and shorter, but in most cases – similarly to the Hungarian cases –cover the most relevant environmental and taxonomy issues. Moreover, further examples can be found where it is clear that companies have already made efforts to produce sustainability information with appropriate content and figures on key environmental objectives even before the introduction of the CSRD, in a voluntary way. This shows that several Polish-owned independent firms and some Poland-located subsidiary companies have the engagement to prepare for the CSRD.

6.3.2. Content analysis of the sustainability reports using relative scores

The fulfilment of taxonomic objectives was assessed for 31 companies (Figure 24). Among the objectives, the highest relative score was for Climate change mitigation (38.7), closely followed by Protection and restoration of biodiversity and ecosystems (31.2). Next were Sustainable use and protection of water and marine resources (28.0) and Transition to a circular economy (26.3). In contrast, the objectives with the lowest relative scores were Pollution prevention and control (22.6) and Climate change adaptation (21.0).

Figure 24

Relative scores by EU taxonomy objectives in Poland



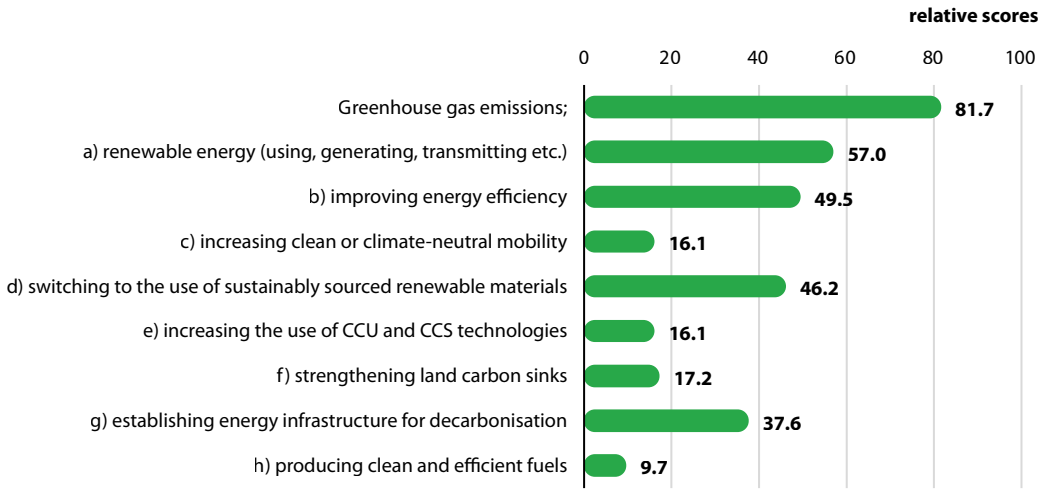
Source: own compilation by the authors

Among the activities contributing to the fulfilment of the Climate change mitigation objective, (a) '**generating, transmitting, storing, distributing, or using renewable energy'** in accordance with Directive (EU) 2018/2001, including the use of innovative technologies with significant

potential for future savings, achieved the highest relative score (57.0). The reports analysed also pointed to the relevance of actions related to (b) 'improving energy efficiency' (49.5) highlighting the growing role of green technologies such as wind, solar and biomass processing power plants and (d) 'switching to the use of sustainably sourced renewable materials' (46.2), which refers to the importance of changing the raw material system to a more sustainable one. Furthermore, the newly introduced aspect of '**Greenhouse gas emissions (GHG)**' received an exceptionally high relative score (81.7). Reducing GHG emissions remains a very important priority in the Polish sustainability sample, highlighting the critical role of emission control in sustainability efforts and introducing specific net-zero strategies and associated year-by-year quantified measurements to demonstrate changes and improvements to prevent and reduce the negative impacts of climate change (Figure 25).

Figure 25

Relative scores of the activities of the climate change mitigation objective

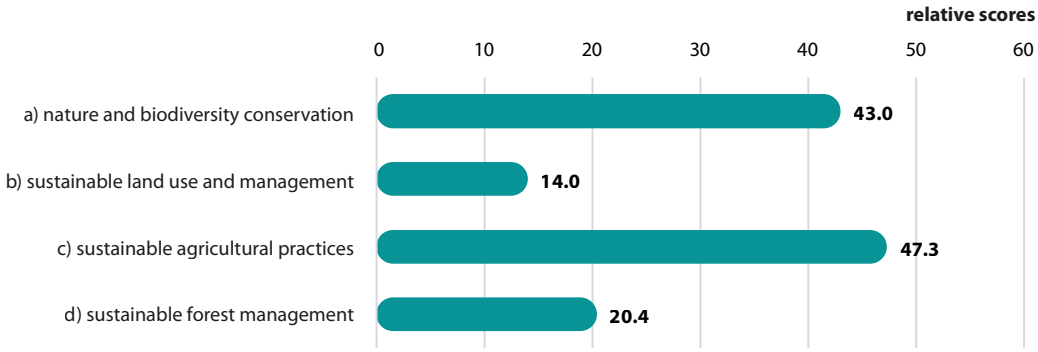


Source: own compilation by the authors

For the objective of Protecting and restoring biodiversity and ecosystems, the highest relative scores were for activity (c) '**sustainable agricultural practices' (**47.3) and (a) 'nature and biodiversity conservation' (43.0), primarily due to the requirements placed on suppliers by 'Global' companies, which are in a strong position as processors of agricultural products, thereby influencing agricultural practices and their level of sustainability. These were followed by activity (d) 'sustainable forest management' (20.4) and with the lowest importance (b) 'sustainable land use and management' that received a lower score (14.0), but it can be concluded that the companies examined are beginning to focus on preventing ecosystem degradation and deforestation (Figure 26).

Figure 26

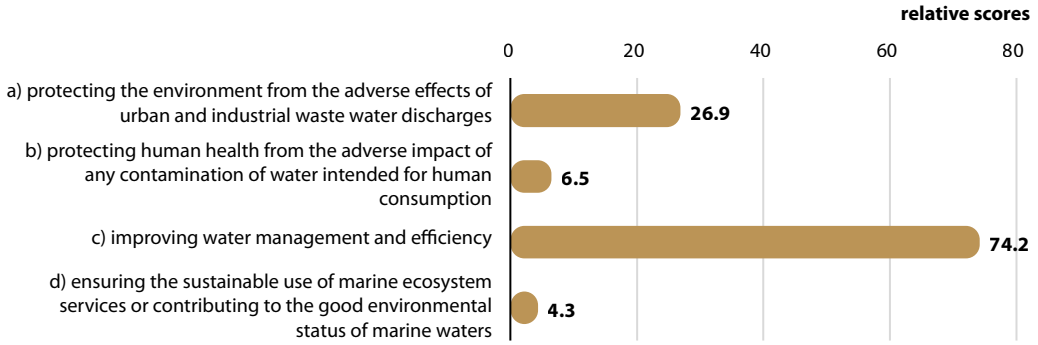
Relative scores of the activities of the protection and restoration of biodiversity and ecosystem objective



Source: own compilation by the authors

Figure 27

Relative scores of the activities of the sustainable use and protection of water and marine resources objective



Source: own compilation by the authors

Figure 27 illustrates the relative scores of activities related to the Sustainable use and protection of water and marine resources, which was an important objective among companies of the Polish sustainability sample. The highest relative score was achieved by activity (c) '**improving water management and efficiency**' (74.2), highlighting the importance of water conservation, reduction in water consumption, water purification, and wastewater treatment – key components of a comprehensive water management system in production processes, from a taxonomy perspective. Following this, activity (a) 'protecting the environment from the adverse effects of urban and industrial wastewater discharges' received the second-highest relative score (26.9). The lowest scores were attributed to activity (b) 'protecting human health from the adverse impact of contaminated water intended for human consumption' (6.5) and activity (d) 'ensuring the sustainable use of marine ecosystem' (4.3). The relative score of the last activity is very similar to the Czech and Hungarian results. It can be concluded that the protection of the marine ecosystem is only

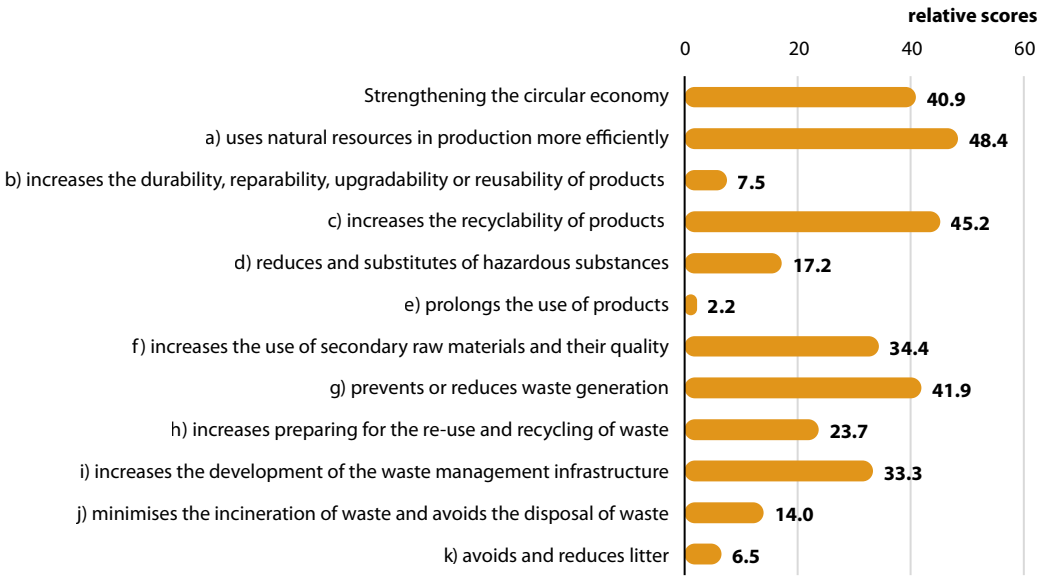
presented in the sustainability strategies of companies where it is either directly important due to products or production (e.g. if the production or the location of a company is closely related to the marine) or indirectly present in the sustainability strategies along the lines of Corporate Social Responsibility (CSR). Furthermore, typically, it is mainly 'Global' companies who pay some attention to protection of marine ecosystem, especially if their suppliers provide marine ingredients and / or raw materials for their products or for marketing reasons.

Figure 28 illustrates the relative scores of transition activities towards the Transition to a circular economy objective, which ranked as the third best-performing goal. The highest relative scores were recorded for activities related to (a) '**using natural resources in production more efficiently'** (48.4), closely followed by (c) '**increasing the recyclability of products**' (45.2) and (g) '**preventing or reducing waste generation**' (41.9). In the Polish sustainability sample, it can be observed that many specific aspects of the Transition to a circular economy objective are emphasised and represented in detail, so that the additionally assigned aspect (a special activity during the research) Strengthening circular economy (CE) is only ranked fourth (40.9). Also important in the activities analysed were (f) 'increasing the use of secondary raw materials' with result 34.4 and activity (i) 'development of waste management activities' (33.3).

It is important to emphasise that what we are identifying here are the preferred courses of action for companies in the ordinary course of business, which aim to optimise resource consumption and promote alternatives to existing energy and raw material sources.

Figure 28

Relative scores of the activities of the transition to a circular economy objective



Source: own compilation by the authors

In conclusion, the assessment of the taxonomic objectives among the 31 companies showed that Climate change mitigation objective received the highest relative score (38.7), closely followed by the Protection and restoration of biodiversity and ecosystems objective (31.2). For companies in Polish sustainability samples the Sustainable use and protection of water and marine resources (28.0) – focusing mainly on water management – and the Transition to a circular economy (26.3) were also important.

Within Climate change mitigation, the highest relative score was achieved by reducing 'Greenhouse gas emissions (GHG)' (81.7), confirming that companies within the Polish sustainability sample consider emission control as a key element of sustainable development. Another important activity was the 'generation, transmission, storage and distribution of renewable energy' in accordance with Directive (EU) 2018/2001, highlighting the importance of innovative energy technologies (57.0). Activities related to improving energy efficiency and changing the raw material system to a more sustainable one also scored highly, indicating the desire of companies to optimise resource consumption and minimise environmental impact.

In the area of Protection and restoration of biodiversity and ecosystems, 'sustainable agricultural practices' (47.3) and 'nature and biodiversity conservation' (43.0) scored highest, as a result of requirements imposed on suppliers by global agri-food processing corporations affecting the level of sustainability of agricultural practices. It is also important to emphasise that the remarkable relative score of 'nature and biodiversity conservation' is a strong national feature particularly characterising the Polish sustainability sample. Sustainable forest management and sustainable land use scored slightly lower, however, indicating a gradual increase in corporate attention to preventing ecosystem degradation and deforestation.

Within Sustainable use and protection of water and marine resources objective, it is noteworthy that 'improving water management and efficiency' (74.2) received the highest relative score, confirming the importance of water saving, water reduction, wastewater treatment and purification as part of water management systems in production processes.

The transition to a circular, closed-loop economy emerged as the third best-rated objective, with the highest relative scores being given to 'using natural resources more efficiently in production' (48.4), 'increasing the recyclability of products' (45.2) and 'prevents or reduces waste generation' (41.9). It can be concluded that the companies in the Polish sustainability sample are paying deep attention to some specific parts of circular economy, going beyond simply emphasising just concepts or general initiatives regarding this topic.

These results indicate companies' preferred courses of action within their day-to-day operations, which focus on optimising resource consumption and promoting alternative energy sources. Despite the growing interest in closed-loop economy issues and biodiversity protection, some areas, such as pollution prevention and marine ecosystem protection, are still in the background,

suggesting that there is a need to strengthen incentives and regulations to support a comprehensive approach to sustainability. Finally, it is worth emphasising that the Polish sustainability sample included 31 companies, but only 14 of them were so-called 'Global' companies. Thus, although 'Global' companies have a large impact on the relative scores and importance areas developed, it can be noted that for Poland (similarly to Hungary), the voluntary reporting activities of both independent domestically owned and independent foreign-owned (non 'Global') companies are improving. There are also some domestic, independent Polish-owned companies that can be considered to have prepared for the NFRD-CSRD transition successfully.

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7. SLOVAKIA

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This chapter summarises the results of three main themes of our V4 research in case of Slovakia.

In the first subchapter, a literature review – regarding environmental ethics, sustainability and ESG initiatives in general, Slovak legal and institutional background, plus Slovak sustainability reporting practices – is presented emphasising the key focus areas of the topic. After that, the financial concentration of the analysed industry is demonstrated. In the third subchapter, detailed relative scoring results of the content analysis of sustainability sample are presented for Slovakia in terms of taxonomy objectives and activities.

7.1. LITERATURE REVIEW

Environmental ethics focuses on the ecological area, investigating the relationship between society and the environment. Currently, increasingly pressing environmental issues like global warming, the ozone layer, etc. have given impetus to increase environmental conservation Miedzgová (1994). In conducting business activities, certain environmental obligations should also be observed. One should carry out their activities in a way that does not disrupt or harm the environment. The science that deals with the environment and its protection is ecology. It highlights the relationship between humans and nature (Franc *et al.*, 2006).

Environmental ethics are often considered the foundation of sustainable living. They encompass principles related to human activity, in our case, the entrepreneur's actions concerning the environment. These principles are based on the entrepreneur's responsibility to maintain suitable conditions for life on our planet. Social responsibility can be defined as the specific accountability of business entities for their actions toward the environment. This is primarily seen in responsible decision-making by managers, creating sound business strategies, and aligning economic, social, and, not least, environmental aspects (Bussard *et al.*, 2005).

Ratings on environmental, social, and governance (ESG) factors provide information about a company's or financial instrument's sustainability performance by assessing its exposure to sustainability risks and its impact on people and the environment.

In reporting, companies have significant flexibility to disclose relevant information, including reporting in annual or separate reports. They may also rely on international, European or national

guidelines (e.g. OECD Guidelines for Multinational Enterprises, ISO 26000, UN Global Compact, etc.).

Slovakia's Accounting Act (Act No. 431/2002) was amended to incorporate NFRD requirements, mandating non-financial disclosures. The act requires affected companies to include non-financial information in their management reports, detailing their business model's impact on the environment, employee matters, and social responsibility. The Ministry of Finance supervises this reporting requirement, ensuring that non-financial statements are submitted alongside financial statements in annual reports.

In terms of sustainability reporting, there is still insufficient consolidation in both the EU countries as a whole and the Slovak Republic. Evidence shows that the ownership structure predominantly consists of companies with a parent accounting unit, which is reflected in the prevailing number of consolidated sustainability reports and a small percentage of companies that did not publish such information or published it solely on their website (Pakšiová, 2017). Our research, which is based on the research sample, also confirmed such findings.

In the international context, the EU states have taken a "phased approach" in adopting the CSRD directive into their legislation. Kinstellar (2023), in its report, points out how the process of transposing the CSRD into national law has begun in all the countries discussed in the report; it is difficult to predict when it will be completed in the various jurisdictions. It is likely that, at least in some jurisdictions, the process will be completed in the second half of 2024. At the time of writing, the Czech Republic, Hungary, Romania, and Slovakia have proposed draft laws implementing the CSRD. At the same time, Bulgarian and Croatia have just set up working groups to prepare draft legal acts.

Jílková and Kotěšovcová (2023) investigated ESG national composite indicators, used to monitor sustainable growth conditions in the EU-27 countries. The study found that a composite index combining multiple indicators or variables into one index or score provides a more comprehensive picture of sustainable growth. The study also found that Northern European economies are at the top of the ranking, while lower-income countries (Bulgaria, Lithuania, Romania, Slovakia, Greece and Cyprus) were found at the bottom with an ESG score of 21.6% and lower.

Moreover, Kozáková *et al.* (2023) found significant disparities between the countries, particularly in the domains of eco-friendly transportation solutions and investments in green technologies for environmental progress. Statistically significant differences were observed between the Czech Republic and Poland and between Poland and Slovakia, thereby shedding light on diverse CSR orientations and priorities within the geographic context. Przytula *et al.* (2019), in their study, point out that environmental issues are addressed in company reports to a significantly greater extent in Poland than in the other two countries. The activities least indicated are those related to biodiversity and ecosystem conservation – 45% of companies in Poland, 18% in the Czech

Republic and 13% in Slovakia. On the other hand, the most popular activities address problems related to the climate change dimension. Similar results were found in our research on behalf of Slovakia, where more than 40% of the activities of sampled companies focus on climate change prevention, followed by the circular economy, making together almost 80% of all activities set out in CSRD.

When analysing the business reports themselves, based on the evidence, more than half of Slovak companies in the investigated sample prepare sustainability reports, which are part of parent companies' full-sustainability reports. Without parent companies, the rest of the companies often publish simplified sustainability reports or provide information on the website.

Skýpalová *et al.* (2024) provide a deep overview of the key focus areas and expressions used in the sustainability reports of multinational companies operating in Slovakia, highlighting their main commitments to environmental, social, and governance (ESG) principles:

- **Primary Focus on Business and Products**: Companies prioritise sustainable practices within their own operations and products, particularly in the energy and sustainability sectors. Efforts include reducing greenhouse gas emissions and investing in renewable energy sources.
- **Commitment to Sustainability**: "Sustainability" is emphasised, with companies setting environmental goals such as emission reductions and renewable energy adoption, showing strong commitments to social and environmental issues.
- **Responsible Management**: Reports outline companies' responsible management practices, targeting reduced environmental impact and community involvement through projects that improve access to resources and education.
- **Annual Progress Tracking**: The term "year" indicates the annual tracking of sustainability achievements, which allows companies to monitor and report progress regularly.
- **Detailed Reporting**: Companies emphasise transparency in reporting, covering areas like revenue, taxes, community support, and ethical compliance, aligning with annual reporting practices.
- **Corporate Responsibility**: Companies prioritise ethical management, fighting corruption, promoting social responsibility, and collaborating with stakeholders (such as NGOs and government bodies) to meet shared sustainability goals.
- **Focus on Development**: "Development" is associated with social and economic growth, local job creation, support for education, and innovation, reflecting a commitment to overall societal development.
- **Active Initiatives**: Reports detail company activities like sustainable development, entrepreneurship support, community involvement, waste reduction, and research.
- **Emphasis on Energy**: "Energy" highlights investments in renewable energy, low-carbon technologies, and climate change mitigation, specific to multinational companies in Slovakia.

Conclusion

The literature overview underscores current challenges related to implementing ESG reporting at the business level in Slovakia. Still, the topic is in its infancy in Slovakia. The main reasons may be identified as follows:

- **Awareness and Expertise:** The lack of awareness and expertise is the main factor contributing to the low quality and availability of ESG reports.
- **Costs of Regulatory Compliance:** Implementing ESG reporting standards is costly (data collection costs, third-party verification, harmonisation of international standards).
- **Harmonisation with EU Standards:** Slovak companies face challenges aligning with the development of pan-European standards, which require a higher level of detail, accuracy, and comparability.

The main reason why Slovak companies elaborate the ESG reports is because they are obligatory. However, there are considerable advantages for companies which have adopted ESG reporting:

- **Investor Demand:** Investors increasingly prefer companies that have adopted strong ESG standards – such companies can attract foreign capital.
- **Competitive Advantage:** Companies that adopt ESG practices can gain a competitive advantage both in domestic and international markets – especially in markets with strong environmental regulations and standards.
- **Government Initiatives:** There are opportunities to obtain grants and subsidies for various "Environmentally Sustainable Activities" (Article 9 of Directive 2020/852 EU)

7.2. FINANCIAL RELEVANCE OF THE SAMPLE

The subchapter is structured to introduce and analyse financial data, focusing on selected companies in the Slovakian food, beverages, and tobacco industry for 2022, with a detailed breakdown of financial indicators across subsectors. In a manner similar to the Czech, Hungarian and Polish analyses, it systematically explores financial concentration, highlighting key subsectors where selected companies hold significant shares, and concludes with data sources and visual aids supporting the analysis.

The following table contains the data of the Slovakian analysis in 2022 regarding the subsectors and main financial parameters (Table 19). It shows the shares of the main financial performance data for the examined group of corporates compared to the subsectors and the whole sector regarding 2022. According to the data in 4 subsectors, shares above 60% were found for *almost* all the parameters analysed (Table 19, Figure 30).

Table 19

Main financial data and shares of the selected companies relative to the subsectors and to the whole sector (2022) in Slovakia

Subsectors (NACE)	Number of companies	Number of selected firms	Share of revenue	Share of net profit	Share of total assets	Share of equity
Processing and preserving of meat and production of meat products (10.1)	369	3	43%	76%	44%	67%
Processing and preserving of fish, crustaceans and molluscs (10.2)	3	0	-	-	-	-
Processing and preserving of fruit and vegetables (10.3)	265	1	29%	35%	34%	28%
Manufacture of vegetable and animal oils and fats (10.4)	28	2	99%	51%	74%	146%
Manufacture of dairy products (10.5)	154	5	75%	87%	74%	87%
Manufacture of grain mill products, starches and starch products (10.6)	108	3	27%	62%	71%	78%
Manufacture of bakery and farinaceous products (10.7)	1,375	4	20%	148%	24%	20%
Manufacture of other food products (10.8)	2,294	6	53%	52%	59%	65%
Manufacture of prepared animal feeds (10.9)	299	0	-	-	-	-
Manufacture of beverages (11.0)	1,117	8	60%	68%	52%	58%
Manufacture of tobacco products (12.0)	3	0	-	-	-	-
Total (selected companies / whole sector)	**6,015**	**32**	**48%**	**71%**	**52%**	**60%**

Note: private enterprises are also included in the whole number of companies in food, beverages and tobacco industries
Source: Authors' own calculation based on the data derived from the purchased database: www.ceginformacio.hu, www.creditreport.hu, and using database of https://ec.europa.eu/eurostat/databrowser/view/sbs_ovw_act__custom_15475826/default/table?lang=en

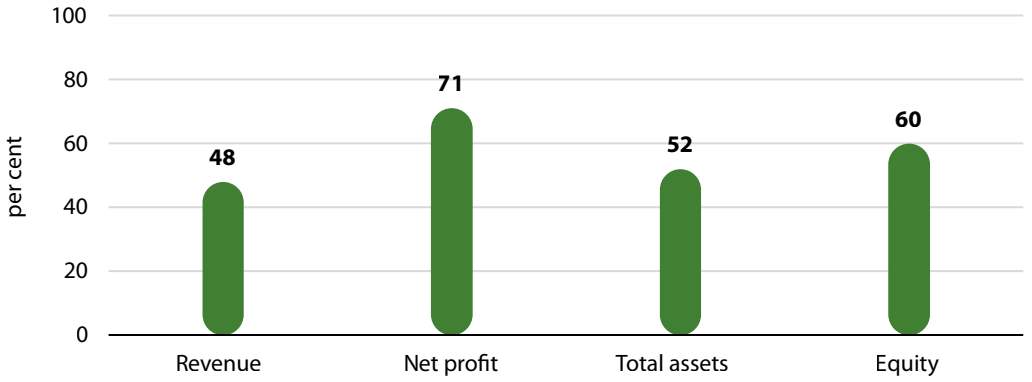
The number of investigated Slovakian firms represented less than 0.6 percent of the total number of corporates in the sector in 2021-2022 interval, focusing on the financial year of 2022.

The data table presents an overview of the financial performance of selected companies within various subsectors of the Slovakian food-processing industry in 2022. The table highlights the share of revenue, net profit, total assets and equity held by these financially selected companies relative to the total number of firms within each subsector and the entire food-processing industry. The data is sourced from Céginfomáció.hu Kft, indicating a compilation of financial information specific to companies located in Slovakia.

The ratio of revenue and the share of total assets were close to 50% in 2022, while the share of equity was 60% and the ratio of net profit exceeded 70% (Table 19). Consequently, the ratios also reflected the strong financial concentration in the sector as a whole in Slovakia (similarly to the Czech, Hungarian and Polish financial sample), regarding the financial year of 2022 (Figure 29).

Figure 29

Share of the main financial characteristics of the selected Slovak companies in relation to the whole national food processing sector (2022)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

The above table containing subsectors as well indicates a comprehensive analysis of the financial status and performance of the selected large firms relative to the whole food, beverages and tobacco industry in Slovakia, in 2022. The analysis focuses on four key financial indicators: revenue, net profit, total assets, and equity, all expressed as percentages (Table 19).

Among the selected large firms 2 companies in the subsector of manufacture of vegetable and animal oils and fats (10.4) stands out with an impressive market share of 99% in revenue and share of 74% in total assets (Table 19). Similar excellent shares can be found in the subsectors of manufacture of dairy industry (10.5), manufacture of other food products (10.8) and manufacture of beverages (11.0). In the dairy processing subsector, all of the main financial parameters exceeded 70% for the selected 5 large companies. In the manufacturing of other food products subsector – where 6 corporates were involved – the share of revenue, net profit, total assets and equity were more than 50% and in the beverages subsector 8 selected corporations represented more than 50% of revenue, net profit, total assets and equity of the whole subsector.

Although the share of turnover was low (27%) in the subsector of manufacture of grain mill products, starches and starch products (10.6), the shares of other financial parameters were high. Moreover, only 3 companies accounted for these high proportions: more than 60% share of the subsector's net profit, and more than 70% of shares of total assets and equity.

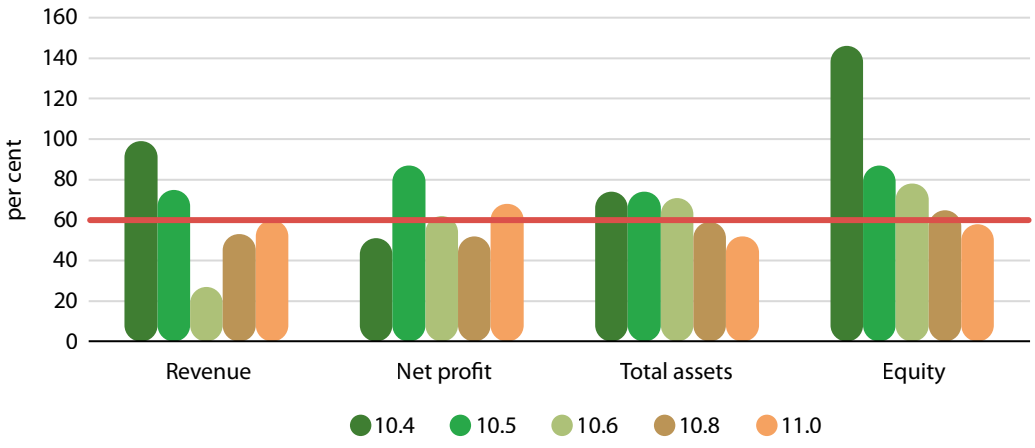
Although the Slovakian food processing sector is the smallest in the V4 region, the role of meat processing is also worth mentioning in the analysis. It is true that only two financial ratios exceeded 60% among the analysed proportions (share of net profit and equity) but the other two (share of revenue and total assets) were not particularly low. Moreover, the sample of large corporates in this subsector included only 3 firms.

Overall, it is evident that the selected large companies in meat processing and vegetable oils and fats manufacturing, like those in the dairy, manufacturing grain mill products and starches, other food production, and beverage sectors, hold a particularly strong position compared to their competitors. This strong position has enabled them to be more successful in local and regional development. These companies, with their high revenue and profit margins, demonstrate their ability to attract customers and create added value in their regions. Furthermore, their reliance on local resources and job creation plays a vital role in economic growth and community improvement. Conversely, companies focused on fruit and vegetable production and bakery products face more significant challenges and require attention and strategic improvements to enhance their local development impact. This analysis can assist managers in making better decisions regarding investments and business development strategies.

Figure 29 highlights again the most important ratios and provides a clear insight into these selected companies' contribution to Slovakia's overall food processing industry. In 2022, the chosen companies accounted for 48% of the total revenue generated in the national food processing sector, indicating their substantial presence in the market. Furthermore, these firms captured a 71% share of the net profit, which suggests that they contribute significantly to revenue with a relatively low cost-structure and achieve above-average profitability compared to other companies in the industry. In terms of assets, the selected companies controlled 52% of the total assets within the sector, which highlights their dominant role in asset accumulation and management in Slovakia's food processing industry. Additionally, they held 60% of the equity, pointing to a solid financial foundation and ownership structure that allows for greater stability and investment capacity compared to the rest of the sector. Overall, these figures emphasise the major role these selected companies play in driving both financial growth and stability within Slovakia's food and beverages industry.

Outstanding subsectors in Slovakia (2022)

Figure 30



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

In terms of financial concentration, those subsectors were considered highly significant in this research where all main financial parameters exceeded 60%. In Slovakia the following 4 subsectors were outstandingly remarkable based on *almost* every investigated main financial data of 2022 in the Slovak financial sample (Figure 30):

Manufacture of food products (10.0) – a total of 10 firms

- Manufacture of vegetable and animal oils and fats (10.4) – 2 firms
- Manufacture of dairy products (10.5) – 5 firms
- Manufacture of grain mill products, starches and starch products (10.6) – 3 firms

Manufacture of beverages (11.0) – 8 firm

In conclusion, outstanding subsectors in Slovakia in 2022 offers valuable insight into the performance of key companies within various subsectors of the Slovakian food and beverage industry (Figure 30, Table 19). The analysis focuses on four key financial indicators: revenue, net profit, total assets, and equity, all expressed as percentages. The manufacture of vegetable and animal oils and fats (2 selected large corporations in 10.4 subsector) stands out with an impressive 99% share of the total revenue, marking these firms as the dominant players in its sector. However, their net profit share is 51%, indicating that while these generate significant revenue, the profitability is slightly lower, thus the cost levels are higher than revenues. These 2 companies also lead in total assets with 74%, suggesting substantial investments in its operations, and it boasts the highest share of equity among the subsectors at 146%, reflecting a strong financial foundation of the selected large companies in this subsector.

5 selected companies in the manufacture of dairy products (10.5 subsector) also perform notably, with a 75% revenue share and an exceptionally high net profit share of 87% - both are relative to the whole subsector -, indicating solid sales and efficiency in turning revenue into profit. These companies hold 74% of total assets and 87% of the equity in the whole subsector, positioning them as the most financially stable and profitable companies in the Slovak food processing sector.

If we consider instead manufacturing grain mill products, starches, and starch products (3 companies in 10.6 subsector), the revenue share is relatively lower at 27%. Still, the companies maintain a solid 62% share of net profit relative to the whole subsector, suggesting that these corporates operate remarkable efficiently despite lower turnovers. Furthermore, 71% share of total assets and 78% equity share show that these 3 large firms are well-positioned regarding resource ownership and financial stability. The selected large firms of manufacturing other food products (6 companies in 10.8 subsector) hold 53% share of revenue and a 52% share of net profit, indicating a balanced performance in both revenues and profitability. This group of corporates controls 59% of total assets and holds 65% of the equity relative to the whole subsector, reflecting a strong but slightly less dominant position than in earlier cases.

Lastly, 8 large firms in the manufacture of beverages (11.0) sector have captured 60% of total revenue in the sector and an impressive 68% of net profit in the sector. These facts show the strong presence of these 8 firms in the beverages sector. Despite having lower share of total assets (52%) and equity (58%) than the selected companies in other subsectors, these beverages corporates remain key players in profitability and market presence. These companies represent outstanding subsectors in Slovakia's food and beverage industry, each vital in driving revenue, profitability, and stability within their respective fields.

In summary, the Slovakian financial sample included 32 companies. We concluded that, compared to the main financial data for the food, beverages and tobacco sector as a whole, this sample of large companies represented significant proportions of the total turnover, net profit, total assets and equity, in a manner similar to the results of the Czech, Hungarian and Polish analyses. The number of investigated firms in the Slovakian financial sample was less than 0.6 percent of the total number of corporates in the food processing industry, but the shares listed above exceeded 50.0 percent in 2022, the only exception being the revenue share which was 48.0 percent. The ratios of net profit and equity exceeded 60.0 percent in 2022, while the ratios of revenue and total assets were close to 50.0 percent (Table 20). Consequently – also in a manner similar to the results for the Czech Republic, Hungary and Poland – the shares also reflected the strong financial concentration in the sector as a whole regarding the financial year of 2022 (Figure 30).

In Slovakia, 4 subsectors were outstandingly remarkable concerning the high shares where *almost* all main financial parameters exceeded 60%: manufacture of vegetable and animal oils and fats (10.4), manufacture of dairy products (10.5), manufacture of grain mill products, starches and starch products (10.6) and manufacture of beverages (11.0).

These four subsectors comprised a total of 18 companies out of the 32 companies in the financial sample in Slovakia. There was only one subsector in which the ratios were relatively low. This was the processing and preserving of fruit and vegetables (10.3), with 1 company. The above analysis demonstrated the financial concentration of the investigated Slovakian food processing industry.

7.3. RESULTS

The subchapter analyses the types of online available sustainability reports concerning the selected large companies in Slovakian food processing sector, categorising them based on their depth and availability using the types listed in the third subchapter of Chapter 3 (Methodology).

In addition, it presents a content analysis of these reports and other environmental documents using relative scoring approach, evaluating corporate sustainability efforts across various EU taxonomy objectives, including climate change mitigation, climate change adaptation, water resource management, the transition to a circular economy, pollution prevention and biodiversity

protection, highlighting key priorities and gaps in each area. Furthermore, we also describe the activities with the highest relative scores within the outstanding taxonomy objectives.

7.3.1. Types of sustainability reports investigated

In Slovakia, **12** of the 32 companies in the financial sample had a sustainability report available online or detailed information about their environmental activities on their website. The typology was the following for the investigated reporting period of 2021-2023:

- Detailed sustainability report (9 companies)
- Simplified sustainability report (1 company)
- Other environmental document (2 companies)
- Detailed website with figures (0 company)

The following subsectors were identified, based on percentages, concerning those 12 companies which had online sustainability reports compared to the number of companies in the financial sample.

Table 20

Main subsectors in Slovakian sustainability sample compared to the financial sample (2022)

Subsectors (NACE)	Number of companies in sustainability sample	Number of companies in narrower financial sample	Share of companies (%)
Processing and preserving of meat and production of meat products (10.1)	1	3	33
Manufacture of vegetable and animal oils and fats (10.4)	**1**	**2**	**50**
Manufacture of dairy products (10.5)	**2**	**5**	**40**
Manufacture of grain mill products, starches and starch products (10.6)	1	3	33
Manufacture of other food products (10.8)	**4**	**6**	**67**
Manufacture of beverages (11.0)	**3**	**8**	**38**

Note: share of companies was calculated as follows: number of companies in sustainability sample divided by number of companies in the financial sample *100
Source: Authors' own calculation

These are the total number of corporates for whom content analyses of sustainability information had been done (Table 20).

The most remarkable subsectors based on the above presented percentages were the following:

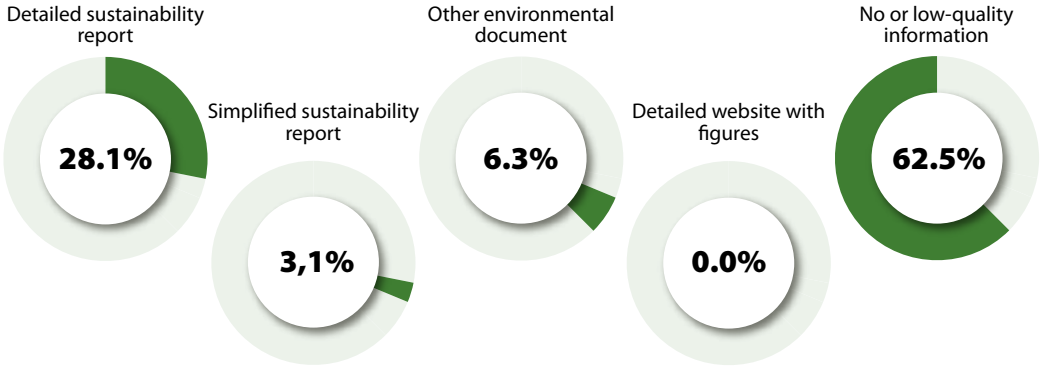
- Manufacture of vegetable and animal oils and fats (10.4): 50%
- Manufacture of dairy products (10.5): 40%
- Manufacture of other food products (10.8): 67%
- Manufacture of beverages (11.0): 38%

These outstanding subsectors covered more than three quarters of the firms (10) from the sustainability sample of 12 companies.

In the Slovakian financial sample, 12 companies had online sustainability reporting at an assessable level, while the remaining 20 companies either had no online sustainability information or the available information was considered to be of low quality during the research (Figure 31).

Figure 31

Sustainability Reporting Practice in the Slovakian Food, Beverages and Tobacco Sector in the investigated period (2021-2023)



Source: authors' compilation

The figure shows the distribution of sustainability reporting practices among 32 companies in the financial sample of Slovakian food, beverages and tobacco sector (Figure 31).

- **No Specific Report**: 62.5 percent of companies (20) do not publish specific sustainability information. It can be stated that some firms had no online sustainability information, while others had only standard documents (e.g. ISO certificate) and/or an energy expert report and/or a short quality policy report, which were not analysed in this research.
- **Detailed Sustainability Report**: 28.1 percent of companies (9) produced a comprehensive sustainability report, the highest share among those that engage in some form of reporting. Almost all the detailed sustainability reports (8) were 'Global' companies' reports, i.e. – as we mentioned earlier in methodology chapter – in the case of the Slovakian subsidiary we assessed the sustainability report prepared by the parent company. Within this group, 6 reports were mandatory in line with NFRD (for the reason of 6 international 'Global' parent companies published detailed reports are listed on various stock exchanges). The rest of detailed sustainability reports (3) were voluntary.
- **Simplified Sustainability Report**: 3.1 percent of companies (1 corporation) issued a basic sustainability report with limited information. It was an annual financial report with simple chapters about environmental and sustainability topics.
- **Other Environmental Documents**: 6.3 percent of companies (2) issued a typically 1-10 pages long alternative environmental documents.

- **Detailed Website with Figures**: 0.0 percent of companies (0) disclosed sustainability-related data on a dedicated website with detailed numerical values regarding the Slovakian sustainability sample.

This breakdown indicates that in Slovakia the majority of companies in the sustainability sample is made up of mainly foreign-owned 'Global' parent companies with detailed sustainability reports. At the same time, the majority of analysed 'Global' corporations in Slovakia – and from other side half of the firms from the Slovakian sustainability sample – is obliged to make detailed non-financial reports due to their listed positions on stock exchanges and their having more than 500 employees. From this reason, these companies are already well prepared for CSRD requirements and usually have an excellent financial background for the development of sustainability, including taxonomy areas.

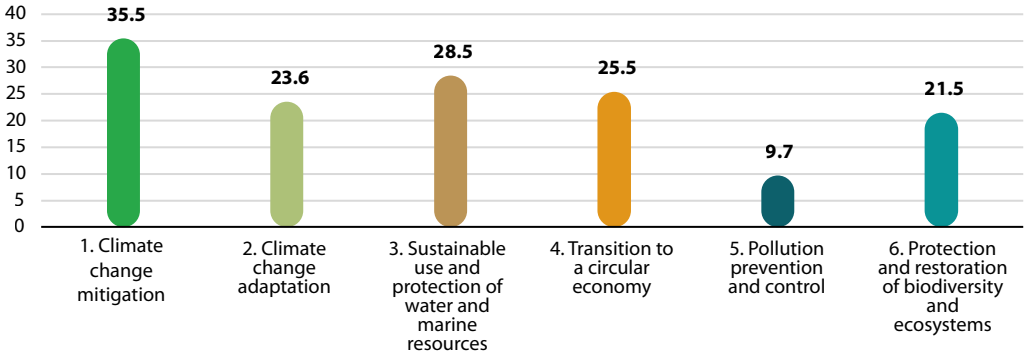
Consequently, although some Slovak-owned domestic companies and some subsidiaries of international, but non-'Global' corporations are taking a few initial steps to communicate their environmental protection and sustainability efforts, but the majority still strongly require development regarding the preparation of formal sustainability reports.

7.3.2. Content analysis of the sustainability reports using relative scores

For 12 companies, the fulfilment of taxonomic objectives was investigated in Slovakia. This sustainability sampled companies put uneven effort into taking main purposes and actions related to filing the EU taxonomy objectives. Climate change mitigation objective received the highest relative score (35.5), followed by Sustainable use and protection of water and marine resources (28.5), after that the Transition to a circular economy objective (25.5) was the next and then, only in Slovakia, in fourth place, was the relative score for Climate change adaptation (23.6). The Protection and restoration of biodiversity and ecosystems objective followed closely behind this (21.5) and Pollution prevention and control had much lower relative scores (Figure 32).

Figure 32

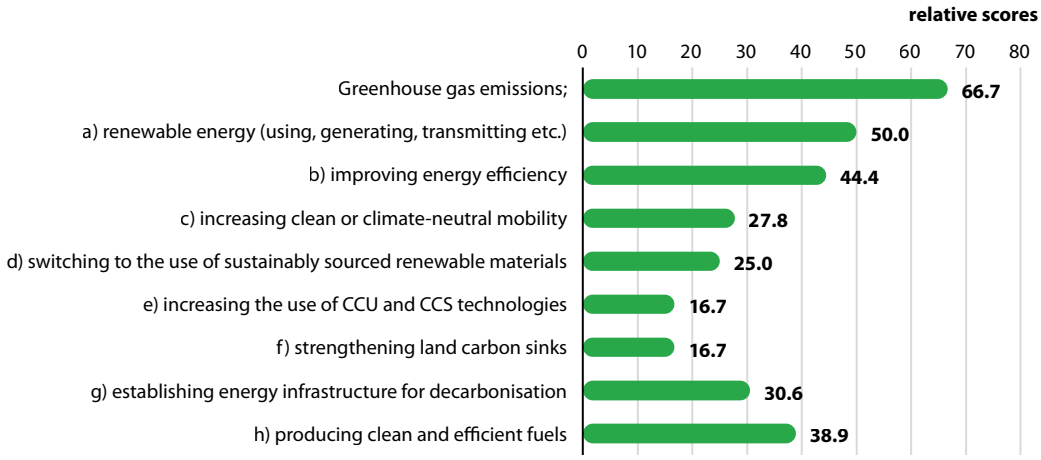
Relative scores by EU taxonomy objectives in Slovakia



Source: own compilation of the authors

Figure 33

Relative scores of the activities of the climate change mitigation objective

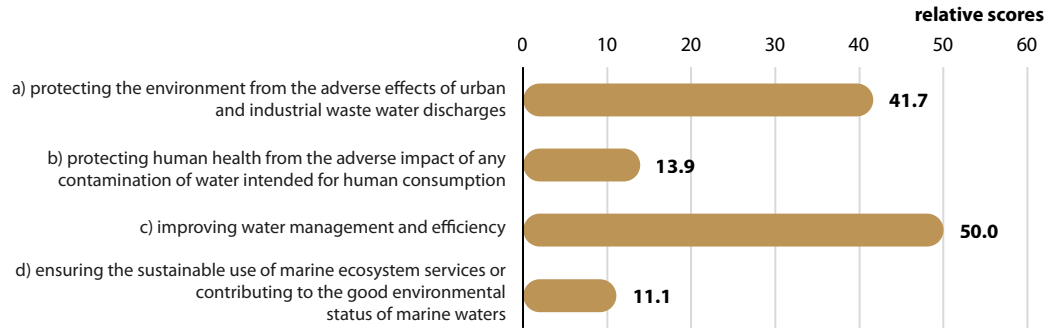


Source: own compilation of the authors

The Climate change mitigation objective became the centrepiece of activities promoting sustainability among the sustainability and taxonomy sampled companies (12 firms). Figure 33 shows the relative scores of the activities related to this objective. The '**Greenhouse gas emission (GHG)**' activity – added by the research team to the original a) – h) activities of EU taxonomy regulation – received the highest relative score (66.7). It was followed by (a) '**renewable energy**' (50.0) and then (b) 'improving energy efficiency' (44.4). Furthermore, (h) 'production of clean and efficient fuels' (38.9) was also significant. The least promoted activities became (e) 'increasing in CCU and CCS technologies' and (f) 'strengthening land carbon sinks', both gained 16.7 relative scores.

Figure 34

Relative scores of the activities of the sustainable use and protection of water and marine resources objective



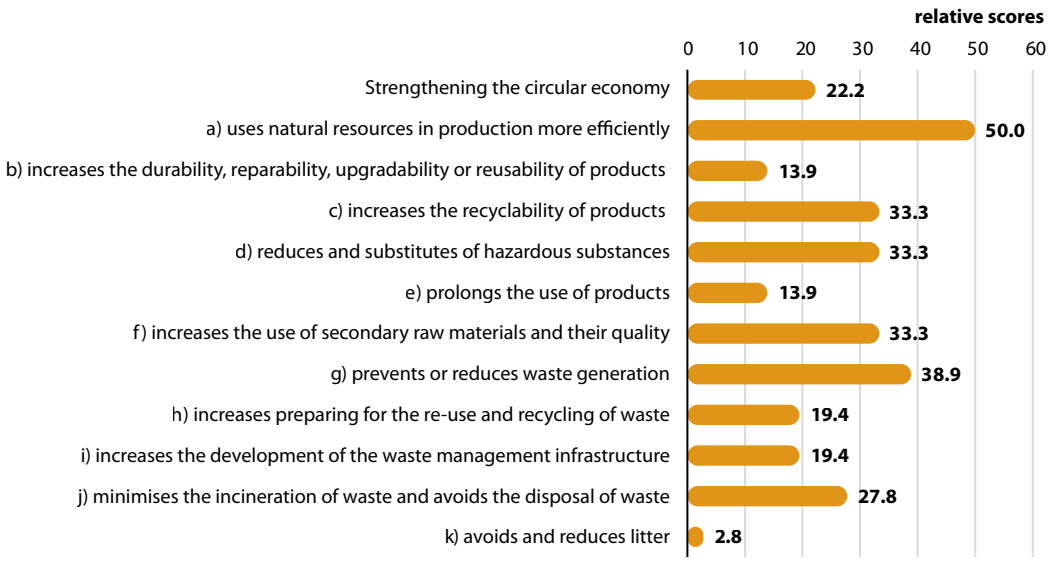
Source: own compilation of the authors

Figure 34 shows relative scores of the activities related to the Sustainable use and protection of water and marine resources, which became the second best-performing objective on behalf of

Slovakian sustainability sample. Among the activities, the highest relative scores achieved were (c) '**improving water management and efficiency**' (50.0), showing that water conservation and reduction in water consumption, water purification and wastewater treatment, i.e. the development of a complex water management system during producing processes, are central issues from taxonomy point of view. Closely related to this, the second relative score was awarded to activity (a) 'protecting the environment from the adverse effects of urban and industrial wastewater discharges (41.7). The lowest-scored activities related to (b) 'protecting human health from the adverse impact of any contamination of water intended for human consumption' (13.9) and (d) 'ensuring the sustainable use of marine ecosystem services or contributing to the good environmental status of marine waters' (11.1). This is natural, as it is primarily the 'Global' parent companies that are concerned with the protection of the marine ecosystem, but this was not a relevant area for the 'Global' companies with a Slovak subsidiary in the sample.

Figure 35

Relative scores of the activities of the transition to a circular economy objective



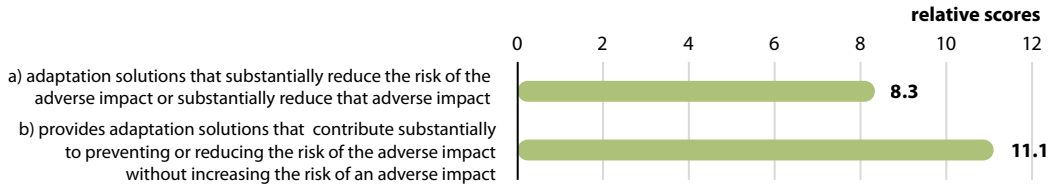
Source: own compilation of the authors

Figure 35 shows the relative scores of the Transition activities to a circular economy objective, which became the third best-performing objective. The highest relative scores recorded activities related to (a) '**uses natural resources in production more efficiently**' (50.0), followed by (g) 'prevents or reduces waste generation' (38.9). After that, three activities received same relative scores (33.3), namely the activities (c) 'increases the recyclability of products', (d) 'reduces and substitutes of hazardous substances' and (f) 'increases the use of secondary raw materials'. All of these three activities are strongly associated with prevention and reduction of waste generation focusing on special areas packaging, reduction of plastic materials and recycling the most pos-

sible parts of the products. Finally, two other activities gained more than 20.0 relative points: (j) 'minimises the incineration of waste' (27.8) and our additionally assigned activity 'Strengthening circular economy (CE)' (22.2). Consequently, although companies considered the sub-areas of the circular economy to be significant, they did not consider the strengthening of the circular economy itself to be a high priority.

Figure 36

Relative scores of the activities of the climate change adaptation objective

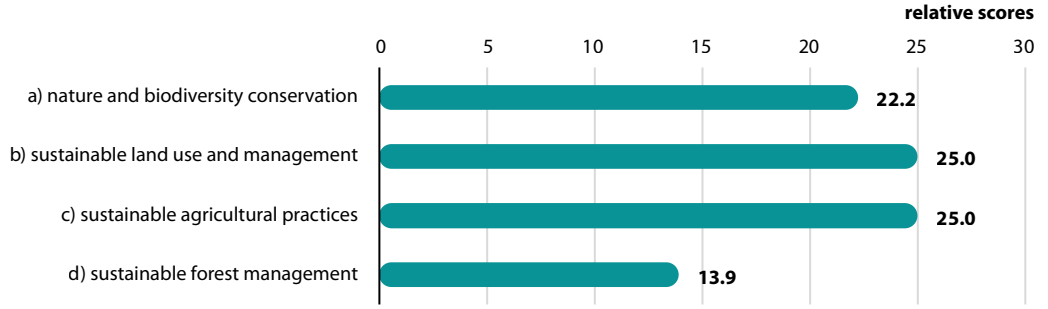


Source: own compilation of the authors

Among the V4 countries, only Slovakia achieved a noteworthy level (the fourth highest relative score among the 6 objectives) for the Climate change adaptation objective (23.6). This fact is due to general measures and/or arrangements in the reports of the 'Global' companies, which are in the majority in the Slovak sustainability sample (Figure 36). These corporations focus more on both the whole value chain including suppliers activities and general climate change risk management initiatives than other types of companies. This objective covers two activities. The activity with the higher relative scores was (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**' (11.1), but (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' achieved only a slightly lower relative scores (8.3).

Figure 37

Relative scores of the activities of the protection and restoration of biodiversity and ecosystems objective



Source: own compilation of the authors

For the Protection and restoration of biodiversity and ecosystem objective, the relative scores for activity (b) '**sustainable land use and management**' and (c) '**sustainable agricultural practices**' were the highest (25.5), primarily due to the requirements imposed on suppliers to 'Global' companies. This was closely followed by (a) 'nature and biodiversity conservation' (22.2). The activity (d) 'sustainable forest management' was less significant (13.9), but it can be concluded that the investigated companies are starting to pay attention to preventing ecosystem degradation and deforestation (Figure 37).

Summarising the results, for the companies in the Slovakian sustainability sample, the highest relative score among the taxonomy objectives was also Climate change mitigation (35.5), followed by Sustainable use and protection of water and marine resources (28.5), then Transition to a circular economy (25.5) and the fourth most prominent objective was the Climate change adaptation (23.6) and finally, Protection and restoration of biodiversity and ecosystems achieved relative scores of (21.5).

Within the Climate change mitigation objective, the highest relative scores were achieved for GHG activity (added arbitrary during the research) (66.7) and (a) 'renewable energy' (50.0) activity. Within the Sustainable use and protection of water and marine resources objective the (c) 'improvement of water management and efficiency' activity had the highest relative score (50.0). Regarding the Transition to a circular economy objective, the (a) 'efficient use of natural resources' (50.0) was the most important activity, followed by (g) 'prevents or reduces waste generation' (38.9). At the same time, it is worth to mention that 'strengthening circular economy' activity (which was another arbitrary added point of view during the research) achieved much lower relative scores (22.2). Among the V4 countries, only Slovakia achieved a remarkable result for the objective of Climate change adaptation due to the general measures reported by 'Global' companies, which are in the majority in the Slovak sustainability sample. Within this objective, the (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' activity received a higher relative score (11.1) than the other (a) activity. Concerning the Protection and restoration of biodiversity and ecosystems objective the relative scores for activity (b) 'sustainable land use and management' and (c) 'sustainable agricultural practices' were the highest (25.5), presumably due to the activities of the 'Global' companies which are focusing on theirs value chain and encouragement of suppliers' motivation regarding development of best practices in land use management and at the field of regenerative agriculture.

The Slovakian sustainability sample included 12 companies, and 9 of them were so-called 'Global' companies. Moreover, within this group of 'Global' companies 6 detailed sustainability reports were mandatory in line with NFRD. Consequently, 'Global' companies have a large impact on the relative scores and importance areas developed, and these are the leaders in the Slovakian transition process from NFRD to CSRD.

7.4. REFERENCES

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8. EVALUATION OF GLOBAL COMPANIES

Authors: *Nóra Gombkötő, Károly Kacz, Andrea Rózsa, Ibolya Lámfalusi*

This chapter summarises the sustainability reporting practices of 'Global' companies in the V4 sustainability samples in terms of the EU taxonomy. We have collected all 'Global' companies from the V4 sustainability samples and analysed the contents of their reports along the taxonomy objectives and activities using the same the relative scoring method that was applied to each country's sample.

In the first subchapter, we present the number of 'Global' companies by country, categorise them into those listed in stock exchanges and non-listed types, and then present the distribution of the types of sustainability reports they produce. The typology focuses in particular on the proportion of detailed reports for this group of companies. Finally, the subsector distribution of 'Global' companies is also presented.

In the second subchapter, we report the results of the relative scoring of the taxonomy objectives and the priority activities within each objective.

The core question that arises is whether the sample of 'Global' companies yields better relative scores than the results obtained so far for the sustainability samples of individual V4 countries.

8.1. SAMPLE OF GLOBAL COMPANIES

This subchapter presents the sample of 'Global' companies from the V4 region's food, beverages and tobacco industry investigated in the research. As was previously pointed out in Chapter 3 (Methodology), in cases where the parent company of a subsidiary in a V4 country prepared a sustainability report during the investigated 2021-2023 period, the research group decided to choose the parent company's report for the content analysis. These big international parent companies were given special attention during the research and were designated 'Global'.

In this section, the analysis contains the details concerning the number of 'Global' corporations including the inner distribution of listed and non-listed companies and subsectors. Table 21 illustrates the total size of 'Global' corporations and shows the number of this group of firms separately in V4 countries, country by country. We analysed altogether **50** companies in the 'Global'

group and within this group, 22 corporations are listed in stock exchanges, while the remaining 28 corporates are non-listed firms.[11]

It is important to explain why the total size of the 'Global' group is not equal to the sum of the numbers of the V4 countries. Two 'Global' companies were identified as having subsidiaries in three countries from the V4 region. Both of these big international mother companies are listed companies. Moreover, 11 'Global' companies had subsidiaries in two different countries from the V4 area. Among these big international mother companies there are six listed and five non-listed companies.

The following correction is therefore necessary during the summarisation of V4 countries' separate number of 'Global' companies. Since, as has been shown above, two of the 'Global' companies analysed have subsidiaries in three countries, '4' should be deducted from the total amount. Furthermore, for the 11 'Global' firms analysed that also have a subsidiary in two countries, '11' should be deducted from the total amount.

This explanation provides the following correct relationships:
1. 17+25+14+9-4-11 = 50;
2. 7+11+8+6-4-6 = 22;
3. 10+14+6+3-5 = 28.

Table 21

Structure of 'Global' corporations in V4 region in 2022

Characterisation of 'Global' companies	Total size	Czech Republic	Hungary	Poland	Slovakia
Number of 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 are listed) are common in 3 of V4 countries, 11 'Globals' (6 listed, 5 non-listed) are common in 2 of V4 countries
Source: own compilation of the authors

8.1.1. Types of sustainability reports investigated

In the whole V4 region 50 'Global' companies were identified during the research among the corporations selected based on the conditions of Article 3 of Directive 2013/34/EU regarding large companies. As mentioned earlier, the selection was based on the data from the annual reports of the financial years 2021-2022 due to the fact that the research started at the end of 2023.

11 See Annex 3 for more details.

However, and as is already also known, although the financial sample selection was based on financial data for the years 2021 and 2022, the timeframe for the sustainability reports or detailed information about the environmental activities and documents available online on the companies' websites was extended to 2021-2023.

The typology of 'Global' forms reports was the following for the investigated reporting period of 2021-2023:

- Detailed sustainability report (39 companies);
- Simplified sustainability report (7 companies);
- Other environmental document (4 companies);
- Detailed website with figures (0 company).

Within this typology, a further grouping point of view was analysed and presented in Table 22.

Table 22

Sustainability Reporting Practice of 'Global' sample in the investigated period (2021-2023)

Typology of 'Global' companies' sustainability reports	Total size	Detailed	Simplified	Other
Number of 'Global' companies' sustainability documents	**50**	39	7	4
Number of listed companies' sustainability documents (mandatory)	**22**	21	1	0
Number of non-listed companies' sustainability documents (voluntary)	**28**	18	6	4

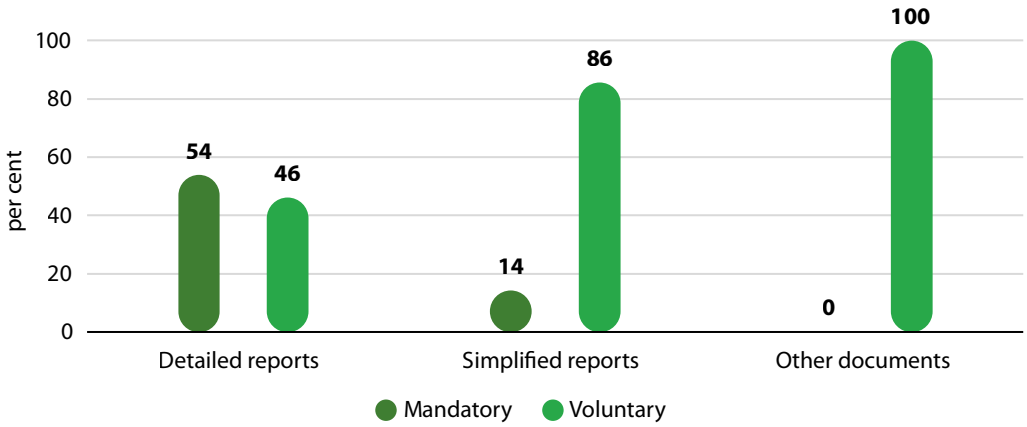
Source: Authors' own compilation

Table 22 shows the inner structure of 'Global' corporations' sustainability documents dividing into two parts: listed and non-listed companies' reports. It can be seen that within the dominant detailed group (39 corporates), listed (21) and non-listed companies (18) are almost equally represented. It is worth noting that the reason for that: currently only listed companies with more than 500 employees are required to prepare a non-financial report during the NFRD-CSRD transition. This implies that the number of listed companies is equal to the number of mandatory sustainability reports, while the number of unlisted companies within the 'Global' group also reflects the number of voluntary sustainability documents.

The next figure also illustrates the above explained distribution (Figure 38).

Figure 38

Distribution of types of sustainability reports in 'Global' sample in the investigated period (2021-2023)



Source: own compilation of the authors based on the database of Céginfomáció.hu Kft.

Finally, the following subsectors were identified concerning the group of 'Global' companies.

Manufacture of food products (10.0) – a total of 43 firms

- Processing and preserving of meat and production of meat products (10.1) – 2 firms;
- Processing and preserving of fish, crustaceans and molluscs (10.2) – 0 firm;
- Processing and preserving of fruit and vegetables (10.3) – 2 firms;
- Manufacture of vegetable and animal oils and fats (10.4) – 6 firms;
- Manufacture of dairy products (10.5) – 5 firms;
- Manufacture of grain mill products, starches and starch products (10.6) – 2 firms;
- Manufacture of bakery and farinaceous products (10.7) – 1 firm;
- Manufacture of other food products (10.8) – 20 firms;
- Manufacture of prepared animal feeds (10.9) – 5 firms.

Manufacture of beverages (11.0) – 5 firms

Manufacture of tobacco products (12.0) – 2 firms

This represents the total number of 'Global' corporates for whom content analyses of sustainability information had been done.

The most noteworthy subsectors based on the above presented numbers of firms were the following:

- Manufacture of vegetable and animal oils and fats (10.4) – 6 firms;
- Manufacture of dairy products (10.5) – 5 firms;
- Manufacture of other food products (10.8) – 20 firms;

- Manufacture of prepared animal feeds (10.9) – 5 firms;
- Manufacture of beverages (11.0) – 5 firms.

Furthermore, the most prominent subsector was 10.8 (with 20 companies), of which 15 produced detailed reports and within this group there were 7 mandatory reports. These five outstanding subsectors covered more than 80 percent of the sample of 50 'Global' companies.

In summary, within the 50 Global companies, two had a subsidiary in three different V4 countries, while 11 had a presence in two different V4 countries. The remaining Global companies had a subsidiary in just one country in the V4 region.

The vast majority (almost 80 percent) of the 'Global' sample produced a detailed sustainability report. Within this, there was an approximately fifty-fifty percent split between mandatory and voluntary reports. Mandatory reports – under NFRD regulation – were produced by listed companies with more than 500 employees. Most of the simplified documents were voluntary, with only 1 report was mandatory. Furthermore, all the so-called other documents were voluntary.

The most noteworthy subsectors of the 'Global' sample were the following: manufacture of vegetable and animal oils and fats (10.4), manufacture of dairy products (10.5), manufacture of other food products (10.8), manufacture of prepared animal feeds (10.9) and manufacture of beverages (11.0). Taken together, these subsectors included more than 80 percent of 'Global' companies.

8.2. RESULTS

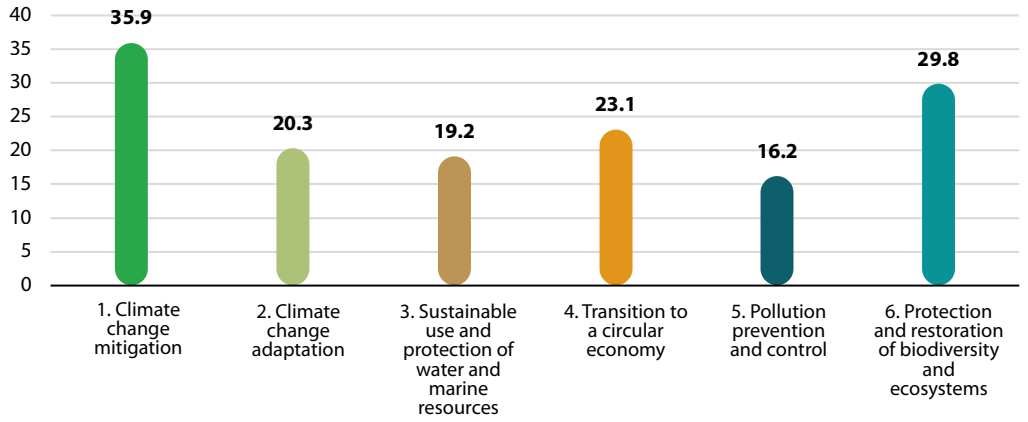
This section presents a content analysis of the 'Global' companies' reports and other environmental documents using the well-known relative scoring approach, evaluating corporate sustainability efforts across the six EU taxonomy objectives, including Climate change mitigation, Climate change adaptation, Sustainable use and protection of water and marine resources, Transition to a circular economy, Pollution prevention and control, Protection and restoration of biodiversity and ecosystems, highlighting key priorities and gaps in each area. Furthermore, the activities with the highest relative scores within the outstanding taxonomy objectives are also described.

8.2.1. Content analysis of the sustainability reports using relative scores

For the **50** companies from the 6 taxonomic objectives examined, Climate change mitigation had the highest relative score (35.9), followed by the Protection and restoration of biodiversity (29.8), after that Transition to a circular economy was the next (23.1). The objectives namely Climate change adaptation (20.3) and Pollution prevention (16.2) reached lower relative scores (Figure 39).

Figure 39

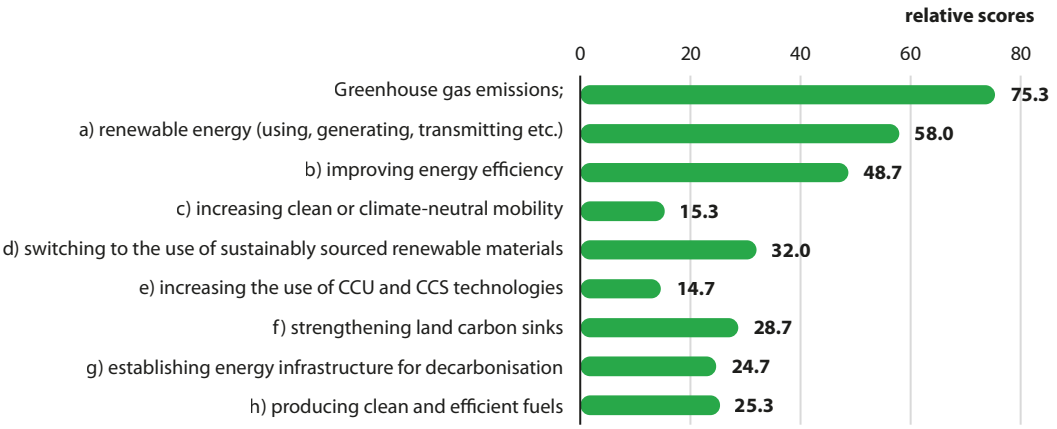
Relative scores by EU taxonomy objectives in 'Global' sample



Source: own compilation of the authors

Figure 40

Relative scores of the activities of the climate change mitigation objective

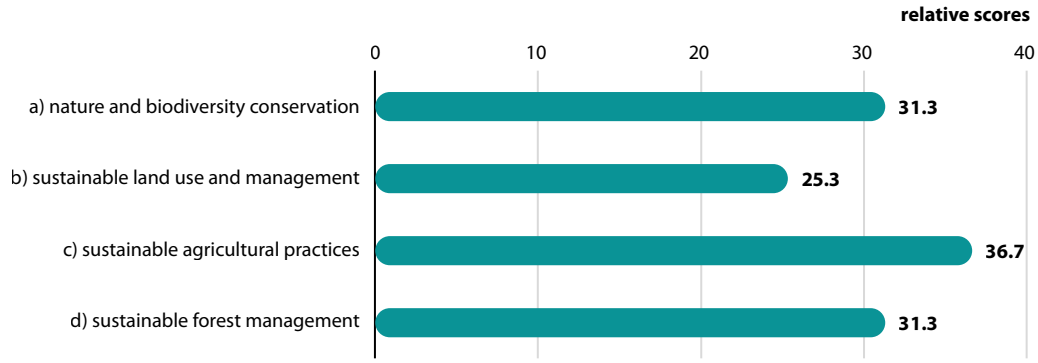


Source: own compilation of the authors

Analysing the activities of the objectives with the highest relative scores, the following results are obtained. Within Climate change mitigation objective, reduction of '**Greenhouse gas emission (GHG)**' received the highest score (75.3), indicating that some companies, even if they do not mention a specific measure, consider GHG emissions reduction to be important. Although, most of the Global companies applied net zero targets for 2030 and 2050 with specific arrangements regarding CO_2 reduction supplemented by detailed figures year by year and comparisons in the monitored period. This arbitrary added GHG activity was followed by the originally taxonomy activity (a) '**renewable energy**' (58.0) and the third highest relative score was reached by (b) '**improving energy efficiency**' (48.7). The other activities received much lower scores (Figure 40).

Figure 41

Relative scores of the activities of the protection and restoration of biodiversity and ecosystems objective

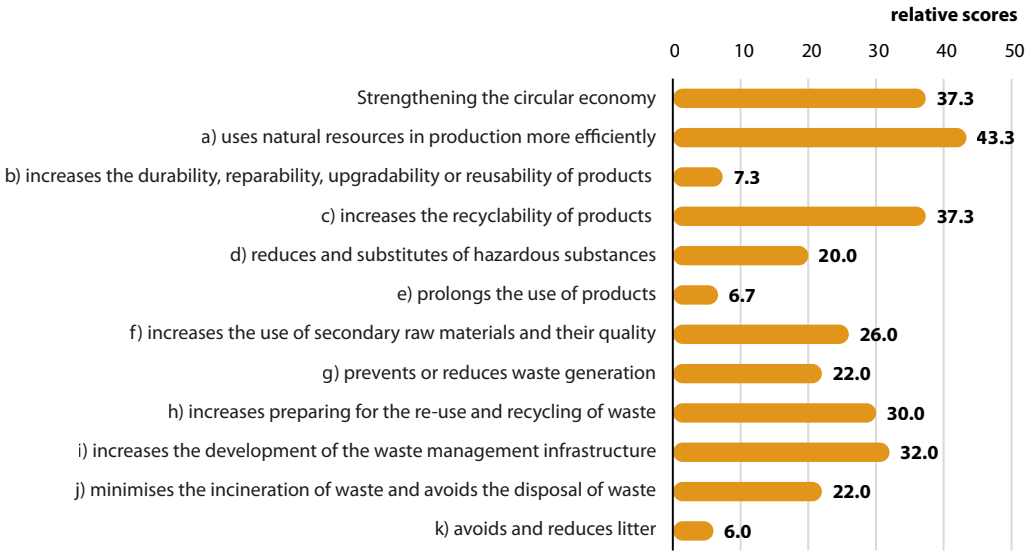


Source: own compilation of the authors

For the Protection and restoration of biodiversity and ecosystem objective, the relative score for activity (c) '**sustainable agricultural practices**' was the highest (36.7), primarily due to the requirements imposed on suppliers to 'Global' companies. This was followed by (a) '**nature and biodiversity conservation**' and (b) '**sustainable forest management**' both with a relative score of 31.3. It can be concluded that the investigated companies are starting to pay attention to preventing ecosystem degradation and deforestation (Figure 41).

Figure 42

Relative scores of the activities of the *transition to a circular economy* objective

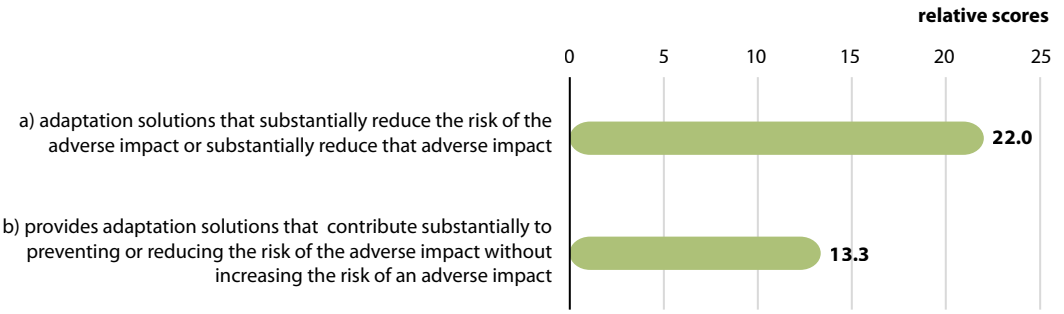


Source: own compilation of the authors

The highest scores in the Circular economy transition objective were achieved in (b) '**uses natural resources in production more efficiently**' (43.3). The additional unique parameter '**strengthening circular economy (CE)'** which was arbitrary added activity during the research and (c) '**increases the recyclability of products**' are both gained same relative scores (37.3). At the same time, companies also pay attention to (i) 'development of waste management' (32.0) and (h) 're-use and recycling of waste' (30.0) activities. Furthermore, (f) 'increases the use of secondary raw materials' (26.0) was also important. Contrary to the above, the following activities scored extremely low: (b) 'increases the durability, reparability, upgradability or reusability of products', (e) 'prolongs the use of products' presumably due to lower relevance in food industry. The lowest relative scores were experienced in the field of activity (k) 'avoids and reduces litter' (Figure 42).

Figure 43

Relative scores of the activities of the climate change adaptation objective



Source: own compilation of the authors

Within the area of the Climate change adaptation, the most prominent activity was (a) '**adaptation solutions that substantially reduce the risk of adverse impact**' with a relative score of 22.0. In comparison, (b) 'providing adaptation solutions that contribute to reducing the risk without increasing other risks' had a lower score of 13.3. This shows a stronger emphasis on direct risk reduction rather than a more balanced approach. It is worth noting that this objective was also among the more important taxonomy objectives in the Slovak sustainability sample, but the relative scores of the activities were reversed in Slovakia. (Figure 43).

Summarising the results, for the companies in the 'Global' sustainability sample, the highest relative score among the taxonomy objectives was also Climate change mitigation (35.9), followed by Protection and restoration of biodiversity and ecosystems (29.8), then Transition to a circular economy (23.1). The fourth most prominent objective was the Climate change adaptation (20.3).

It is noteworthy that although this sample included the greatest number of listed companies (22 companies) which were required to produce mandatory non-financial reports under NFRD regulation, thus both in theory and as expected, these companies had to provide detailed

information on each sustainability area. However, of course, the relative scoring method did not depend on the number of companies in the sample, as this was a key feature of the relative scoring approach used. Nevertheless, the assumption and the expectation were that the deeper sustainability content should have been reflected in higher relative scores, due to the mandatory reporting. Yet, contrary to these facts and expectations, the relative scores along the taxonomy objectives in the 'Global' sample were similar to the scores in the V4 sustainability samples country by country.

This suggests that companies that produce voluntary reports are in many cases already producing sustainability reports of a similar professional level to the mandatory reports under the NFRD.

This means that, in addition to regulation, market competition also may play a major role in how companies communicate their environmental and sustainability initiatives, arrangements and monitoring approaches to their stakeholders and how they contribute to a healthier and more liveable future.

Regarding the most important taxonomy activities in 'Global' sample the following results could be concluded. Within the Climate change mitigation objective, the highest relative scores were achieved for GHG activity (added arbitrary during the research) (75.3), (a) 'renewable energy' (58.0) and (b) 'improving energy efficiency' (48.7) activity. Within the Protection and restoration of biodiversity and ecosystem objective the (c) 'sustainable agricultural practices' activity had the highest relative score (36.7). Regarding the Transition to a circular economy objective, the (a) 'efficient use of natural resources' (43.3) was the most remarkable activity, followed by (c) 'increases the recyclability of products' and CE (strengthening circular economy) activity (which was also added arbitrary during the research). Both of these activities were relatively scored with 37.3. Concerning Climate change adaptation objective (contrary to the Slovakian results) the activity (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' received a higher relative score (22.0) than the other (b) activity. So, 'Global' companies' efforts mainly focus on direct risk reduction solutions, with less emphasis on broader adaptation strategies.

All in all, Global companies play a crucial role in setting sustainability standards, particularly through supply chain requirements. While progress is evident, expanding efforts in circularity and a more balanced approach to climate adaptation remains a key opportunity.

9. SUMMARY

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This chapter summarises the conclusions and future research opportunities regarding the whole research along the objectives set in Chapter 2 (Objectives).

In the Conclusion subchapter, the main results are summarised in the following order. First, we highlight the key elements of the regulatory background on which we have based this study. Then, based on the sample selection principles and main financial data of the samples, the financial concentration is demonstrated as a consequence of the analysis of the financial samples in the V4 countries. In the next step, for the narrower sustainability samples, the types of sustainability documents, the types of companies and outstanding subsectors are presented in common tables for the V4 region. Subsequently, based on the relative scoring formula (presented in subchapter 3.1. Applied method), the main results of the content analyses of the sustainability documents investigated are illustrated in a common table for the V4 region along the most important objectives and activities of the taxonomy. After that, the relative scores of the most important taxonomy objectives and activities are also compared with the content analysis results of the 'Global' companies' reports. At the end of this subsection, we highlight the main consequences and the novelty of our research, also presenting the limitations and shortcomings of the approach applied.

In the future research opportunities subchapter, the potentials for further follow-up research are emphasised, including the opportunities for geographical expansion and further methodological possibilities and improvements.

9.1. CONCLUSIONS

Our study was based on the following regulatory background. We analysed in detail the specific decision-making and political legislative background related to climate change and sustainability, the most important elements of which are, in chronological order – in line with the application date of the decision, the Directive, the Regulation or the legislation/proposal in general – : 17 SDGs of UN Agenda (2015), Paris Agreement (2016), NFRD (2017), Green Deal (2019), EU Taxonomy (2020), 8th EAP (2022), New Delivery Model of CAP (2023), CSRD (2023), Omnibus I. and II. Proposals (2025). These are the key pieces of legislation and initiatives that provided the basis for our study and research.

Our research started in October 2023, supported by the IVF in the form of a V4 Grant with ID 22320032 named by acronym of 'V4GreenReporting'. Our main objective was to understand and quantify the preparedness of large companies in the food processing industries (broadly food (NACE C10), beverages (NACE C11) and tobacco (NACE C12) segments) of the V4 countries for the NFRD-CSRD transition. The methodology and basic questions of the previous Hungarian research (Lámfalusi *et al*., 2024)12 was applied to the V4 region. In this way, our endeavour was considered to be a follow-up study.

As the first step of the research, the financial samples were identified and then financial concentration of the V4 food-processing industries was analysed. Data on the food processing industries of V4 region was purchased from an external data provider ('Céginformáció.hu Kft.'). In accordance with Article 3 of Directive 2013/34/EU, large companies were selected if any two of the following three indicators exceeded the following thresholds in the last two financial years: (1) total assets of EUR 20 million, (2) annual net revenue of EUR 40 million, (3) average number of employees in the financial year of 250. At the beginning of the project, the financial reporting data for 2021-2022 were available, so we selected the large companies based on that data.

Thereafter, the revenue, net profit, total assets and equity data of both the entire industries by country and the selected large company groups by country were analysed and compared. These groups of large firms were called financial samples.

We concluded that the shares of the number of selected companies relative to the whole industries were very low (< 3%), but the financial relevance of these financial samples was very high (> 50%) relative to the financial performance of the whole sector regarding revenue, net profit, total asset, and equity country by country in the V4 region in 2022. The financial concentration of the food-processing industries was demonstrated in all of the V4 countries based on the main financial data: total revenue, net profit, total assets and equity (Table 23).

Table 23

Financial concentration of V4 food processing industries in 2022

V4 countries / Investigated parameters	Czech Republic	Hungary	Poland	Slovakia
Whole financial samples (number of large companies)	69	86	337	32
Whole sectors (number of companies)	~ 10,000	~ 4,000	~ 20,000	~ 4,000
Share of companies (%)	< 1%	< 3%	< 2%	< 1%
Shares of total revenue relative to the whole sector (%)	68%	67%	77%	48%
Shares of net profit relative to the whole sector (%)	71%	62%	65%	71%
Shares of total assets relative to the whole sector (%)	73%	62%	78%	52%
Shares of equity relative to the whole sector (%)	76%	53%	81%	60%

Source: own compilation of the authors

12 Lámfalusi I., Hámori J., Rózsa A., Hegyi J., Kacz K., Miklósné Varga A., Trojan, Sz. and Gombkötő N. (2024), "Evaluation of sustainability reporting of the food industry in Hungary from an EU taxonomy perspective", Quality & Quantity, Vol. 58 No. 5, pp.4479-4504, available at: https://doi.org/10.1007/s11135-024-01873-2

During the research, financial and sustainability samples were differentiated. From the financial samples we selected those firms whose had online available sustainability documents on their websites according to the following types of documents: detailed sustainability reports (with GRI standard), simplified sustainability reports, other (environmental) documents, and websites with figures.

The investigation period for the sustainability documents available online was the 2021-2023 interval. In each case, the most recent document available was selected.

It is important to note that due to the large size of the Polish financial sample (337 firms), the research was restricted to corporates with more than 500 employees (107 corporations) in Poland. In selecting the Polish sustainability sample, the research team aimed to analyse the most relevant companies from the subsectors that were significantly represented in the financial sample. At the same time, it was also important to take into account that the Polish sustainability sample should include companies that are also actors within common significant subsectors of the V4 countries.

We concluded that the numbers and shares of a detailed sustainability report were the highest in all of the V4 sustainability samples (Table 24).

Table 24

Main features of sustainability samples in V4 food processing industries (2021-2023)

V4 countries / Investigated parameters	Czech Republic	Hungary	Poland	Slovakia
Whole financial samples (number of large companies)	69	86	337	32
Whole sustainability samples (number of companies)	21	46	31[a)]	12
Types of the online sustainability documents				
Detailed sustainability report	15	25	13	9
Simplified sustainability report	3	5	11	1
Other document	1	13	3	2
Website with figures	2	3	4	0

[a)] Note: In the Polish case the sustainability sample was selected from the group of those 107 corporates had more than 500 employees.
Source: own compilation of the authors

In the case of the investigated companies in sustainability samples, we distinguished three types in the study: independent company (typically a domestically owned company, without subsidiaries), subsidiary company (typically a large foreign-owned company or group of companies with subsidiaries in one or more V4 countries), and parent company (typically a large domestically or foreign-owned company with subsidiaries in other countries as well).

The research team decided that in cases where the parent company of a subsidiary in a V4 country prepares a sustainability report, the research group would select the parent company's report for the content analysis. These corporations were given special attention during the research and were indicated by the label 'Global'.

We hypothesised that 'Global' corporations would have a large impact on the relative scores of the content analysis. However, we were also curious to observe any differences or similarities in the reporting practices of listed and non-listed companies focusing on mandatory and voluntary reporting. This aspect is discussed in detail later, separately in the summary and comparison section regarding 'Global' companies.

The next table presents the distribution of 'Global' corporates' reports among the different types of online sustainability documents investigated (Table 25).

Table 25

Distribution of 'Global' corporations among the assessed online sustainability documents in V4 region (2021-2023)

V4 countries / Investigated parameters	Czech Republic	Hungary	Poland	Slovakia
Whole sustainability samples (number of companies)	21	46	31	12
Types of the online sustainability documents				
Detailed sustainability report	15	25	13	9
'Global' companies' report	*14*	*20*	*11*	*7*
Simplified sustainability report	3	5	11	1
'Global' companies' report	*3*	*3*	*3*	*0*
Other document	1	13	3	2
'Global' companies' report	*0*	*2*	*0*	*2*
Website with figures	2	3	4	0

Source: own compilation of the authors

As can be seen from the table above, the vast majority of detailed sustainability reports were 'Global' corporate reports: 93.3% in Czech Republic, 80.0% in Hungary, 84.6% in Poland and 77.8% in Slovakia. In addition to this, there were also some simplified reports and other documents among the 'Global' reports.

During the detailed investigation of the sustainability samples, we also identified the most relevant subsectors. We analysed what percentage of companies were represented in the sustainability sample by subsector compared to the original financial sample. The results were as follows (Table 26).

Table 26

Most relevant subsectors in sustainability samples of V4 countries (2021-2023)

V4 countries / Most relevant subsectors	Czech Republic	Hungary	Poland	Slovakia
Common relevant subsectors				
Manufacture of vegetable and animal oils and fats (10.4)	100%	75%	100%	50%
Manufacture of other food products (10.8)	71%	80%	37%	67%
Manufacture of beverages (11.0)	38%	89%	50%	38%
Country specific subsectors				
Manufacture of tobacco products (12.0)	100%			
Manufacture of bakery and farinaceous products (10.7)		67%		
Manufacture of prepared animal feeds (10.9)			50%	
Manufacture of dairy products (10.5)				40%

Note: Percentages were calculated as follows: number of companies in sustainability sample / number of companies in financial sample, except in the Polish case, when instead of 337 companies of financial sample, the calculation was done using the mentioned 107 companies with more than 500 employees. Both the financial and sustainability sample were divided into subsectors.

Source: own compilation of the authors

At the same time, it is important to note that the numbers of firms within the main subsectors were different. Moreover, there were two cases where only one large corporation was selected in both the financial and sustainability samples, thus it caused a result of 100%. Similarly, the reason for the third 100% was that three identical companies were in the financial and sustainability samples at the same time.

In addition, these prominent subsectors listed in the table covered:

- all the companies (21) from Czech sustainability sample of 21 firms;
- half of the firms (23) from the Hungarian sustainability sample of 46 companies;
- almost half of the firms (14) from the Polish sustainability sample of 31 companies;
- more than 80 percent of the firms (10) from the Slovakian sustainability sample of 12 companies.

The main aim of our research was to analyse the content of online available sustainability documents of large companies in V4 sustainability samples according to the objectives and activities of the EU Taxonomy. For the content analysis, the relative scoring formula presented in Chapter 3 (Methodology) was applied. During our research period, most of these large companies were not yet obliged to report under the NFRD but will be required to report under the CSRD from 2026. Accordingly, we focused on the initial phase of the NFRD-CSRD transition.

Based on the content analysis of the sustainability documents, we obtained the following relative scores of taxonomy objectives for the total number of companies in the sustainability sample, country by country in V4 region, when the maximum relative score was 100.0 (Table 27).

Table 27

Relative scores per taxonomy objectives in V4 sustainability samples

V4 countries / Taxonomy objectives	Czech Republic	Hungary	Poland	Slovakia
1. **Climate change mitigation**	**35.4**	**28.9**	**38.7**	**35.5**
2. Climate change adaptation	21.4	12.3	21.0	23.6
3. Sustainable use and protection of water and marine resources	**28.6**	**22.1**	**28.0**	**28.5**
4. Transition to a circular economy	25.8	18.1	26.3	**25.5**
5. Pollution prevention and control	20.2	11.6	22.6	9.7
6. Protection and restoration of biodiversity and ecosystems	**35.3**	**19.9**	**31.2**	21.5

Source: own compilation of the authors

It is important to note that the relative scoring formula eliminates the effect of the number of elements in the samples, so the results obtained are comparable. Considering the analysed sustainability samples, it can be stated that the Polish sample achieved the highest relative scores, while the Hungarian sample achieved the lowest.

The most relevant taxonomy objectives (above 25.0 relative score) in the Czech Republic, Hungary and Poland were objectives 1. Climate change mitigation, 3. Sustainable use of water and 6. Protection of biodiversity. While in Slovakia objectives 1. Climate change mitigation, 3. Sustainable use of water and 4. Transition to a circular economy were key.

At this point in the summary, it is worth returning to the earlier assumption that the content of the sustainability reports of 'Global' companies is of higher quality, with a consequent influence on the rankings. For this reason, it is worthwhile to compare the above results with the relative scores of the 'Global' companies (Table 28).

Table 28

Relative scores per taxonomy objectives concerning 'Global' sample

'Global' sample / Taxonomy objectives	'Global' sample
1. **Climate change mitigation**	**35.9**
2. Climate change adaptation	20.3
3. Sustainable use and protection of water and marine resources	19.2
4. Transition to a circular economy	**23.1**
5. Pollution prevention and control	16.2
6. Protection and restoration of biodiversity and ecosystems	**29.8**

Source: own compilation of the authors

The table shows that the relative scores of the 'Global' sample are very similar to the relative scores of the V4 country samples. In subchapter 8.1 (Sample of 'Global' companies) we examined the internal structure of this group, divided into listed and non-listed corporations. Listed mother corporations are obliged to report under NFRD while non-listed companies are not.

At the same time, the shares of listed and non-listed companies in the V4 samples and in the 'Global' sample do not differ significantly from each other. This suggests that companies that produce voluntary reports are in many cases already producing sustainability reports of a similar professional level to the mandatory reports compiled under the NFRD.

It therefore appears that the competitive situation in the industry influences the content and quality of sustainability reports at least as much as mandatory regulations.

Finally, focusing on the four highest relative scoring taxonomy objectives in V4 region, we present those taxonomy activities (including the two arbitrary added GHG and CE activities as well) that received the highest relative scores within each objective (Table 29).

Table 29

Highest relative-scored taxonomy activities within the most important taxonomy objectives in V4 region

V4 countries / Outstanding taxonomy activities	Czech Republic	Hungary	Poland	Slovakia
1. Climate change mitigation	GHG emission a) renewable energy	GHG emission b) energy efficiency	GHG emission a) renewable energy	GHG emission a) renewable energy
3. Sustainable use of water	c) improving water management	c) improving water management	c) improving water management	c) improving water management
4. Transition to circular economy	a) efficient use of natural resources Strengthening CE	a) efficient use of natural resources Strengthening CE	a) efficient use of natural resources	a) efficient use of natural resources
6. Protection of biodiversity	d) sustainable forest management c) sustainable agricultural practices	c) sustainable agricultural practices	c) sustainable agricultural practices	b) sustainable land use management c) sustainable agricultural practices

Source: own compilation of the authors

We aimed to highlight the activities with the highest relative scores in the table; however, in cases where the scores of two activities were similar or identical, we emphasised both.

In summary, the following identical activities were considered the most important by the selected groups of companies in all V4 countries. Regarding the 1. Climate change mitigation objective, the arbitrary added 'GHG emission' and a) 'renewable energy' activities were especially noteworthy. Within the 3. Sustainable use of water objective c) 'improving water management and efficiency' activity received the highest relative scores in all countries. Concerning the 4. Transition to a circular economy objective a) 'efficient use of natural resources' was the common outstanding activity in V4 region. In case of the 6. Protection of biodiversity objective the c) 'sustainable agricultural practices' activity was highlighted in all V4 countries.

In summary, our results are presented in a concise way as follows:

1. The financial concentration of the food, beverages and tobacco industries in the V4 region was demonstrated country by country and based on the financial sample selection and the investigation's main financial data regarding the 2021-2022 period. This confirmed the preliminary assumption of the research team, which was based on previous Hungarian research.
2. The sustainability samples were investigated in detail regarding types of sustainability documents, types of companies and most relevant subsectors. The main conclusions concerning this part of the research are as follows. Among report types, shares of detailed sustainability reports were dominant. In terms of types of companies, shares of 'Global' corporates were noteworthy. In the Czech Republic, Hungary and Slovakia more than a half of the firms from sustainability samples were 'Global'. In Poland almost the half of investigated corporates were 'Global'. Among subsectors the following three common subsectors were prominent in V4 region based on percentages: manufacture of vegetable and animal oils and fats (10.4), manufacture of other food products (10.8), and manufacture of beverages (11.0).
3. Content analysis of the sustainability documents of the selected companies' groups country by country formed the core of the research. We focused on the objectives and activities of EU Taxonomy and our self-improved relative scoring method was applied to the assessments. The original activities of the EU Taxonomy were assigned with two additional activities, namely 'GHG emissions' activity within the 1. Climate change mitigation objective, and 'Strengthening circular economy', i.e. 'CE' activity within the 4. Transition to a circular economy objective. The common three taxonomy objectives with the highest relative scores in V4 region were: 1. Climate change mitigation, 3. Sustainable use and protection of water and marine resources, 6. Protection and restoration of biodiversity and ecosystems. The most prominent common taxonomy activities with the highest relative scores in V4 region were: 'GHG' emission and a) 'renewable energy' activities within the 1. objective, c) 'improving water management and efficiency' activity within the 3. objective and c) 'sustainable agricultural practices' activity within the 6. objective.

   Concerning the 'Global' sample, the results of the content analysis were quite similar, but not the same. The most relevant taxonomy objective was 1. Climate change mitigation, with the highest relative-scored activities: 'GHG' emission and a) 'renewable energy'. It was followed by the objective 6. Protection and restoration of biodiversity and ecosystems with the highest relative-scored activity: c) 'sustainable agricultural practices'. An important difference was that for the 'Global' sample, the third most important taxonomy objective was 4. Transition to a circular economy, with the highest relative score for the following activity: a) 'efficient use of natural resources'. At the same time this activity stood out in the V4 region within the 4. objective.

   We stated that the relative scores of the 'Global' sample are similar to those of the V4 region, and that the competitive situation influences the content of the reports at least as much as the NFRD legally mandatory requirement for listed companies to report. Thus, our second hypothesis, that 'Global' companies significantly influence the relative scores of the samples, was rejected. Rather, it was significant that we narrowed the Polish sample to companies with

more than 500 employees, which have a much stronger competitive position. This is therefore most likely to account for the slightly higher relative scores of the Polish sample.

4. An important additional aspect to note is that the individual taxonomy objectives or activities are not equally relevant in the food processing sector. For example, the activities of the Protection and restoration of biodiversity and ecosystems objective are typically found in scope 3 areas,[13] i.e., at the level of the food industry suppliers, the farmers. The dimensions of the objective Adaptation to climate change are also more relevant for scope 3 areas and, due to the nature of the activity, are less likely to occur in scope 1 areas (which is the processing company itself) but are highly relevant for agricultural companies. However, a food processing (and in a wider sense a beverages and tobacco) company with a strong focus on sustainability has a value chain approach and can take sustainability into account when choosing its partners or influencing them, for example through contractual conditions.
5. Finally, we concluded that in addition to regulation, market competition also may play a major role in how companies communicate their environmental and sustainability initiatives, arrangements and monitoring approaches to their stakeholders – particularly to their suppliers regarding sustainable agricultural practices – and how they contribute to a healthier and more liveable future.

In the green transition, the cooperation of the V4 countries is very important. Due to the economic crisis caused by the Ukraine war and the rise in prices of energy, raw material and agricultural inputs, the role of the food industry has become particularly important in this region. From the point of view of political, supplier, producer and consumer decision-making it is increasingly important to take into account green aspects in a way that makes food supply safe, healthy and affordable for the society based on the use of renewable energy. The cooperation of smaller regions is necessary both to maintain employment and to control quality.

The main novelty of the research was that our collaboration resulted in a gap-filling study. We applied a unique mix of a content analysis approach and a relative scoring methodology from an EU Taxonomy perspective in a special and very important industry, which plays a crucial role in the V4 regional economies and societies concerning the life sustenance of people and human health in general.

Within the framework of the V4 Grant the research team has successfully prepared an extended study based on the previous preceding Hungarian research through the involvement of Czech, Polish and Slovakian food, beverages and tobacco industries in order to analyse similarities and differences. This successful research has allowed us to obtain a comprehensive picture of the preparedness of the food processing industries of the V4 region for the NFRD-CSRD transition.

13 Scope 3 emissions are all indirect emissions–not included in scope 2–that occur in the value chain of the reporting company, including both upstream and downstream emissions. (Scope 1 emissions are direct emissions from company-owned and controlled resources. Scope 2 emissions are indirect emissions from the generation of purchased energy, from a utility provider.)

Moreover, this collaboration provides an opportunity to continue our investigations when CSRD reports become mandatory. Based on this research a full V4 analysis as a follow-up study could be prepared in the future. The essence and the aim of this follow-up study could be to measure the changes in the content and quality of sustainability reports. We could explore specific modifications made by large companies during the switching process from NFRD to CSRD, i.e. switching from voluntary to mandatory reporting. This is true even if the potential adoption of the Omnibus Proposal slows down and modifies the process and narrows the scope of companies.

Due to our analysis of industries, company data and online sustainability reports, we have formulated significant conclusions from an EU Taxonomy perspective, which are likely to have significant impacts on the behaviour of different stakeholders (like political decision-makers, financiers, academic experts, companies and consumers) once they have been disseminated. They might also stimulate V4 green transition activities as well as make them more effective.

Our research naturally had limitations, as we had 20 months to complete the project.

One of the main shortcomings of our research is the lack of involvement of the companies concerned. The review of our research results was carried out by our research team by means of a very simple cross-check.

Secondly, this rudimentary cross-checking procedure could be significantly improved by involving ESG experts from the companies under study, for example through a questionnaire or a telephone interview.

Thirdly, we applied a simple but insightful relative scoring formula. This approach could be further developed and deepened, along lines that we have already presented in our recent new study in Hungary.

9.2. FUTURE RESEARCH OPPORTUNITIES

Our scientific analysis has been based on an excellent, high-level database and a well-established, verified qualitative and quantitative methodology derived from the professional literature complemented by the scientific ideas of the research team. An outstanding advantage of the research is that the professional investigation applied here can be repeatable and expandable in the future, either in the BIOEAST or in the whole EU region.

In possible and planned follow-up research, the main focus could be to reduce the limitations of this research based on the following ideas. Follow-up research might involve:

- more detailed financial analysis (e.g. Du-Pont analysis) of selected companies and samples;

- professionally more advanced cross-checking process and involvement of selected companies using questionnaires and corporate interviews;
- application of additional formulae (in order to evaluate the content of sustainability reports in more detail, in line with taxonomy activities and subsectors).

We plan to use and recommend the application of the following deeper relative scoring formulas employed in our earlier Hungarian studies regarding the subsectors of the food processing industry:

Formula (2)

$\boldsymbol{p_s}$: relative score of the s. subsector:

$$p_s = \frac{\sum_{k=1}^{35} \sum_{l=1}^{m_s} x_{kl}}{m_s * 3 * 35} * 100$$

$s \in \{1, \dots, 11\}$

$s = 1$ refers to NACE C10.1, $s = 10$ refers to NACE C11.0, $s = 11$ refers to NACE C12.0

m_s: number of the companies in the s. subsector within the analysed group, $\sum_{s=1}^{11} m_s = \boldsymbol{C_v}$

x_{kl}: company score per taxonomy activity within the s. subsector, $x_{kl} \in \{0,1,2,3\}$

$k = 1, \dots, 35$: index of the number of taxonomy activities

$l = 1, \dots, m_s$: index of the number of companies within the s. subsector

$\boldsymbol{C_v}$: number of large companies with online available sustainability report in the country's sample

Formula (3)

$\boldsymbol{P_{ts}}$: relative score of the t. taxonomy objective within the s. subsector:

$$P_{ts} = \frac{\sum_{j=1}^{n_t} \sum_{l=1}^{m_s} x_{jl}}{n_t * 3 * m_s} * 100$$

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

$s = 1$ refers to NACE C10.1, $s = 10$ refers to NACE C11.0, $s = 11$ refers to NACE C12.0

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

m_s: number of the companies in the s. subsector within the analysed group, $\sum_{s=1}^{11} m_s = \boldsymbol{C_v}$

x_{jl}: company score per taxonomy activity, where company is in the s. subsector and activity is in the t. taxonomy objective, $x_{jl} \in \{0,1,2,3\}$

$j = 1, \dots, n_t$: index of the number of activities within the t. taxonomy objective

$l = 1, \dots, m_s$: index of the number of companies within the s. subsector

$\boldsymbol{C_v}$ number of large companies with online available sustainability report in the country's sample

Finally, we consider it to be an excellent opportunity for potential future research to investigate the significance of the so-called double materiality by applying correlation analysis to discover the possible correlations between financial data and quality of sustainability reports.

Although the February 2025 Omnibus I. and II. Proposals contain several modifications and simplifications for the future regarding NFRD-CSRD transition, our research team believes that our present comprehensive study can provide a professionally sound basis for future research and better decisions on the part of stakeholders concerning the green transition.

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Visegrad Fund

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10. ANNEX

10.1. LIST OF ANNEXES

Annex
1

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Source: Authors' own compilation

Annex 2

The most prominent ESG research centres in Hungary

Institution	Name of the research centre	Website link
Corvinus University, Budapest	Sustainable Finance Research Centre	https://www.uni-corvinus.hu/post/landing-page/research-centers-corvinus-university-of-budapest/sustainable-finance-research-centre/?lang=en
University of Debrecen, Debrecen	Biodiversity, Water Management and Climate Change Competence Centre	https://unideb.hu/en/phonebook/department/3700588
University of Pécs, Pécs	Sustainability Centre (CAL/ESG)	https://cal.ktk.pte.hu/hu/fenntarthatosagi-kozpont, https://cal.ktk.pte.hu/hu/esg
University of Szeged, Szeged	SZTE Greennovation Centre	https://greennovation.hu/en
Central Bank of Hungary, Budapest	Sustainable Finance Centre	https://mnbintezet.hu/rolunk/
Hungarian Research Network (HUN-REN), Budapest	Sustainability Centres	https://hun-ren.hu/research_network

Source: Authors' own compilation

Annex
3

'Global' companies investigated in V4GreenReporting research

Short name of the corporation (50)	NACE	Type of sustainability report	Listed[a] (22)	Stock Exchange link	CZ (17)	HU (25)	PL (14)	SK (9)
Mecom	10.1	Detailed	no					1
OSI Food	10.1	Detailed	no			1		
BONDUELLE	10.3	Detailed	Yes	https://markets.ft.com/data/search?query=bonduelle		1		
Rauch	10.3	Detailed	no			1		
ADM	10.4	Detailed	Yes	https://markets.ft.com/data/search?query=ADM&country=&assetClass=	1			
BUNGE	10.4	Detailed	Yes	https://markets.ft.com/data/search?query=Bunge&country=&assetClass=Equity		1	1	
NT (Agrofert Group)	10.4	Simplified	no			1		
Preol (Agrofert Group)	10.4	Simplified	no		1			
Vandamme	10.4	Other	no			1		
Viterra	10.4	Detailed	no		1			
DANONE	10.5	Detailed	Yes	https://markets.ft.com/data/equities/tearsheet/summary?s=BN:PAR			1	
Friesland	10.5	Detailed	no			1		
Hochland	10.5	Simplified	no				1	
Rajo (Meggle)	10.5	Other	no					1
SAVENCIA-FORMAGE	10.5	Detailed	Yes	https://markets.ft.com/data/search?query=Savencia&country=&assetClass=Equity		1		
Dr. Oetker	10.6	Detailed	no		1	1		
TATE & LYLE	10.6	Detailed	Yes	https://markets.ft.com/data/search?query=tate&country=&assetClass=				1
Intersnack	10.7	Simplified	no			1	1	
Arxada	10.8	Detailed	no		1			
BAPA (Orkla)	10.8	Detailed	Yes	https://markets.ft.com/data/equities/tearsheet/profile?s=ORK:OSL	1			
CLOETTA	10.8	Detailed	Yes	https://markets.ft.com/data/search?query=cloetta				1
DANISCO (IFF)	10.8	Detailed	Yes	https://markets.ft.com/data/equities/tearsheet/profile?s=IFF:NYQ	1			

Annex 3

Short name of the corporation (50)	NACE	Type of sustainability report	Listed[a] (22)	Stock Exchange link	CZ (17)	HU (25)	PL (14)	SK (9)
GIVAUDAN	10.8	Detailed	Yes	https://markets.ft.com/data/search?query=Givaudan&country=&assetClass=Equity		1		
ED&F Man	10.8	Detailed	no		1			
Ferrero	10.8	Detailed	no				1	
Jacobs Douwe	10.8	Detailed	no		1			
Haribo	10.8	Other	no			1		
Hipp	10.8	Detailed	no			1		
Lesaffre	10.8	Detailed	no			1		
MONDELEZ	10.8	Detailed	Yes	https://markets.ft.com/data/search?query=mondelez&country=&assetClass=			1	1
NESTLÉ	10.8	Detailed	Yes	https://markets.ft.com/data/search?query=nestle+SA&country=&assetClass=	1	1	1	
Pekarna Zelena (Agrofert Group)	10.8	Simplified	no		1			
PEZ	10.8	Detailed	no			1		
Povazsky Cukor	10.8	Other	no					1
Slovenske Cukrovary (AGRANA)	10.8	Detailed	Yes	https://markets.ft.com/data/search?query=agrana&country=&assetClass=				1
TEREOS	10.8	Simplified	no		1			
UNILEVER	10.8	Simplified	Yes	https://markets.ft.com/data/search?query=unilever&country=&assetClass=Equity		1	1	
Wrigley	10.8	Detailed	no		1			
Cargill	10.9	Detailed	no			1	1	
DSM	10.9	Detailed	Yes	https://markets.ft.com/data/search?query=DSM		1		
Mars	10.9	Detailed	no			1	1	
Partner in Pet Food	10.9	Detailed	no			1		
UBM	10.9	Detailed	Yes	https://markets.ft.com/data/equities/tearsheet/summary?s=UBM:BUD		1		
COCA-COLA	11.0	Detailed	Yes	https://markets.ft.com/data/search?query=Coca-Cola+Co&country=&assetClass=Equity	1	1	1	

Annex 3

Short name of the corporation (50)	NACE	Type of sustainability report	Listed[a] (22)	Stock Exchange link	CZ (17)	HU (25)	PL (14)	SK (9)
HEINEKEN	11.0	Detailed	Yes	https://markets.ft.com/data/search?query=heineken&-country=&assetClass=		1		1
KOFOLA	11.0	Detailed	Yes	https://markets.ft.com/data/search?query=kofola&-country=&assetClass=	1			1
PEPSI	11.0	Detailed	Yes	https://markets.ft.com/data/equities/tearsheet/summary?s=PEP:NSQ			1	
Stock Plzen (Stock Spirits)	11.0	Detailed	no		1		1	
British American Tobacco (BAT)	12.0	Detailed	Yes	https://markets.ft.com/data/search?query=british+american+tobacco&country=&assetClass=		1	1	
Philip Morris (PM)	12.0	Detailed	Yes	https://markets.ft.com/data/search?query=Philip+Morris	1			

[a] Note: if a 'Global' company is listed, it has mandatory report based on NFRD
Source: Authors' own compilation

AKI

www.aki.gov.hu Agrarkozgazdasagi.Intezet AKI_Hungary aki-hungary